

Enhancing Urban Governance through Public Private Partnership: A Study of Solid Waste Management in Dhaka City

**A Dissertation
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Statement of the Candidate

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“Praise be to Allah, the Cherisher and Sustainer of the Worlds” (*Al Quran*, Chapter 1:2), Who have given me the strength and ability to put and end to this difficult task, as He promised, “Verily with every difficulty there is a relief” (*Al Quran*, Chapter 94:6).

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List of acronyms/ Abbreviations used

SWM	Solid Waste Management
JICA	Japan International Cooperation Agency
DCC	Dhaka City Corporation
CBO	Community Based Organization
PPP	Public Private Partnership
WHO	World Health Organization
MSW	Municipal Solid waste
ISO	International Standard Organization
UNEP	United National Environmental Programme
LDAC	Least Development Asian Countries
NGO	Non Government Organization
TMG	Tokoy Metropolitan Government
ASEAN	Asian South East Asian Nations
CDM	Clean Development Mechanism
HCE	Health Center Establishment
HIV	Human Immune Virus
\$	United States Dollar

Abstract

An escalating quality of life and high rates of resources consumption patterns have had an unintended and negative impact on the urban environment generation of wastes far beyond the handling capacities of urban govt. and agencies. Cities are now grappling with the problems of high volumes of waste, the cost involved, the disposal technology and the impact of wastes on the local and government environment. Therefore, at this moment it is very much needed to make a proper plan for waste management and disposal system it has also been observed that waste can be another source for earning money. So, keeping this objective in mind, this study attempts to develop a proposed marketing model for waste management system in Dhaka city. It can also be considered as a preventive waste management approach, which is focused on changes in lifestyles and in production and consumption patterns. This article also tries to find out the commercial value of waste. Last but not least it is a proposal rather than a conclusive study. It needs a more pragmatic test for its reliability study.

Enhancing Urban Governance through Public Private Partnership: A Study of Solid Waste Management in Dhaka City

CHAPTER-1

Dhaka, once upon a time, “It was a beautiful city , sometimes easily mistaken for a village” Bartly Bart wrote in his “Romance of an eastern city”

INTRODUCTION

Dhaka is one of the mega and one of the dirtiest cities in the world. It has a population near 12 million with a population growth of nine percent urbanization, while growth rate is ten percent and per capita income is US\$476 (Huda 2008:245). In Dhaka City Corporation (DCC) area sixty percent houses belong to people of low income, thirty seven percent middle income and the rest three percent constitutes high-income houses. The old part of Dhaka is more densely populated than the new part of Dhaka. There are over 1,000 small and large industries including 149 tanneries, about 500 clinics and hospitals located within the boundaries of the city. These factors leads the city to generate around 4000 to 5000 tons solid waste everyday, which require to be disposed to enable the city to be habitable for citizens living within it.

Dhaka City Corporation is the only formal organization responsible for management of waste, estimated to be around 4000 to 5000 tons everyday. According to a report of JICA2005, it may assume a mid-figure about 4,000 tons of solid waste generation within the DCC area everyday. These wastes are deposited together in the same primary handling depots from where about 45 percent is finally disposed of either by the DCC or Community Based Organizations (CBOs) in the open landfill sites situated at Matuail near Jatrabari, Beribadhin Mirpur, Savar and in Uttara(.JICA 2005:25)

Out of 4000-5000 tons of waste produced, about 40-50 percent is disposed in the landfills and the rest left unattended and locally dumped. It is estimated that between 14 -17 percent of the total municipal budget is used for solid waste management which is approximately Tk. 26/- (0.5 US\$) per capita per year (Yousuf 2000:202) . Around 7,500 cleaners are engaged in street sweeping and waste collection activities in Dhaka city. The number of cleaners per thousand population in Dhaka is nearly one (JICA 2005:37). It is to be noted that waste densities (350 to 450 kg/Cu.M) and moisture contents (50 percent to 70 percent by wt.) are much higher than the wastes in developed countries, as it generally contains a high organic (50 percent to 70 percent) and low combustible matter.(www.dcc.org)

It shows prospects as well as throws multifarious challenges to a developing country like Bangladesh. The prospects exist in the sense that organic portion of solid waste is sixty to seventy percent, is excellent for converting it into fertilizer to be used in food production. It is challenging as it contains high moisture content which requires high level of heat for incineration which is not cost effective and viable for a developing country like Bangladesh. What can be done then? This study tries to come up some answers.

A Brief Glance of Waste Management in Dhaka City

The Solid Waste Management of DCC is operated in following 4 phases :

- **Primary Collection & Accumulation:**

Normally the households bring their refuse to the nearby communal bins/containers located on the street side, while in some specific areas community has arranged house to house collection of garbage with their own initiatives and efforts. The household, commercial, institutional & medical wastes are deposited in the same waste collection bins located on the streets. Street sweeping is done manually and debris are loaded from the kerb-side into the handcarts and delivered into the collection bins. However, still most of the domestic, commercial & Industrial Solid Wastes are being accumulated into the dustbins/containers by the concerned households/owners themselves.

Transportation :

The wastes are transported by fleet of open (flat bedded) or closed vehicles (with vertically sliding shutter on both sides) from the city - where the roads and the lanes in the older part of the city are narrow. In the new part, de-mountable container system (hydraulically operated) is working. Every vehicle has got specified areas and route through which they move to collect wastes. Presently, 370 Nos. of trucks (Both open & covered) and container carriers are engaged in transporting the Solid Wastes from the dustbins/containers to the disposal sites. For loading they use cane basket & "Belcha"(Shovel) (www.dcc.org)

Final Disposal :

Garbage Trucks & Carriers' bring the collected Solid Wastes to the selected Dumping Sites. City Wastes are only being used for filling low-lying lands. Some heavy equipment like Bull-Dodger, Tire Dodger, Pay-Loader Excavators are being used for dressing & compaction of the dumping site. The waste is presently being disposed off mainly on a lowland (Matuail) about 3 kilometer from the corporation area and a number of minor sites which are operated in an uncontrolled manner without any proper earth cover and compaction. The uncollected wastes are dumped in open spaces, streets, clogs drainage system creating serious environmental degradation & health risks.

In Dhaka city, residential and commercial sources produce most of the total municipal waste. A JICA study in 2005 shows 63 percent (2120 tons/d) of the total waste (3,340) is from residential sources while another project of the Dhaka City Corporation(DCC) estimated that it is 49.08 percent. Other sources, for example commercial and industrial waste volume is not specified clearly in JICA's "Clean Dhaka Master Plan" study but according to DCC and some other recent studies, commercial waste generation is no less than 20 percent of the total (Bhuiyan & Hossain 2002:39).

Statement of the Problem

DCC incomes are classified into three categories: 1) Revenue Income, 2) Government Grant, and 3) Government and Foreign Agencies/Donors Support. DCC has as many as 19 regular revenue income items. Among these items, only 5 items contribute around 83 percent to total revenue incomes and they are: 1) Holding Tax, 2) Market Rent, 3) Market Salami, 4) Trade License, and 5) Property Transfer Fee. . Holding (property) taxes are 63 percent of DCC revenue earning(JICA 2005:24). Holding Tax is composed of Property Tax seven percent, Conservancy Rate two percent and Lighting Rate three percent and imposed on annual value of property that a taxpayer owns. Most of the revenue expenditure (fifty five percent is incurred for salaries and wages. According to Islam,2005”The own source income for the year 2001-2002 was Tk. 1557.2 million and other source (Government) was Tk. 540.5 million. The subsidy from Government for last five years is from 25.77 percent to 38.43 percent The expenditure incurred for the development only ranges from 51.17 percent to 64.25 percent during last five years. DCC charges conservancy tax of two percent based on property’s annual rental value. There is always negative correlation between income and expenditure. The expenditure of SWM is 52.87 percent more than the income.” The per capita expenditure for SWM in Dhaka is very low (Tk. 53.00) compared to other Asian cities such as Bombay Tk.304.00, Manila Tk. 192.00 and Bangkok Tk. 84.00 (Enayetullah 1995:65). DCC spent 15.42 percent of the total annual expenditure for SWM (Yousuf 96:38). The solid waste management cost of DCC is Tk. 313.12 /cubic meter of which collection cost is Tk. 120.54(32.75 percent, transportation cost is Tk. 150.09(47.90 percent) and disposal cost is Tk. 60.60(19.37 percent) per cubic meter (Salam 2001:23).

Dhaka City Corporation is functioning on the basis of "Dhaka Municipal Corporation Ordinance XL 1983". The ordinance has no specific clause or section for industrial hazardous or clinical waste storage, handling, collection, transportation and disposal either by DCC or privately. Necessary by-laws have not yet been introduced on “Standard” of refuse quality and details of punishment of any offence detected by DCC mobile court.

Dhaka City Corporation is yet to have any Solid Waste re-cycling project. However, wastes which have market value are being reclaimed or salvaged for recycling. Recycling contributes to resource conservation as well as environmental protection. A major part of the solid waste of the DCC remains uncollected. This uncollected waste mostly remains in bins, temporary roadside depots, and open spaces or street sides causing a number of problems. These are hazardous items like broken

glass, razor blades and explosive containers may pose health risks especially on that population who partially live off the waste disposal sites.

Large quantities of solid waste remain on the street everyday in the residential, commercial and industrial areas. This causes bad odor, which is very uncomfortable for pedestrians and local people. Uncollected waste spreads vermins and pollute the surrounding environment, not only that commercial solid waste and waste water released on the Buriganga, Sityalakma and other rivers adjacent to Dhaka contaminate river water badly and contributes to overall environmental pollution. Unsanitary dumping also causes ground and surface water contamination. In this context, DCC landfill sites are open, with no gas collection system or leachate treatment technology(except Matuail) The Beri Bund landfill is very close to the Buriganga River and leads to pollution of the river. In Matuail, the major landfill site is located within 1 km of residential areas (for example Jatrabari, Jurain). Actually, most of the abandoned landfill sites are also close to residential areas. Matuail receives 65 percent of the total disposal volume, Beri Bund and Uttara receive 30 percent and 5 percent, respectively JICA study team,2005. In fact, only about 44 percent of the total generated waste (3,340 tons/day) is disposed at 3 landfill sites and the remaining forty six percent remains uncollected and contributes to unhealthy, and environmentally degrading condition.

The DCC is still quite unable to keep up its utility services due to its budget constraints and lack of other resources. It lacks institutional capacity also comparing to other city management in developing countries. The conservancy tax., DCC charges, 2 percent based on property's annual rental value revenue of the DCC is lower than its expenditure, which is the main reason behind inadequate solid waste collection and management. It was found that the DCC spent 476 million taka in 2002-03 for solid waste management, while the conservancy tax revenue was only 146 million Taka(JICA,2005). Expenditure on SWM has increased in last few years but the gap between expenditure and tax revenue remains high.

There are a number of laws and policies, for example, the Dhaka City Municipal Ordinance, 1983; National Environmental Management Action Plan (NEMAP, 1995-2005); Urban Management Policy Statement, 1998; National Policy for Water Supply and Sanitation, 1998. Above the legislations there is no specific guideline regarding sold waste management. Besides these, no independent legislation is there regarding solid waste management

Objectives

This study will therefore try to :

Get an overall picture of present solid waste management in DCC.

Relate public private partnership with solid waste management .

Suggest ways to develop institutional capacity of DCC for solid waste management.

Rationale of the Study :

Dhaka, the Capital City of Bangladesh, is expanding rapidly turning into a mega city with an enormous growth of population at a rate of around 9 percent a year. Solid wastes are being generated at a faster pace, posing a serious management as well as environmental threat. Rapid growth of industries, lack of financial resources, inadequate trained manpower, inappropriate technology and lack of awareness of the community are the major constraints of solid waste management for the fast growing metropolis of Dhaka. A healthy life, cleaner city and better environment are the logical demands for the city dwellers as the municipality is traditionally funded for solid waste services from municipal tax system for waste collection and disposal. Due to limited finances and organizational capacity, it has been really difficult for the DCC to ensure efficient and appropriate delivery of solid waste collection and disposal services to the entire population

The uncontrolled disposal of solid waste has led to many environmental problems including localized flooding through clogging of drains. One study thus remarks that despite high demand for all forms of recyclable material in Bangladesh and a large number of people involved collecting and recycling industrial commercial and kitchen refuse, solid waste is one of the most visible form of pollutants found in city streets, open areas, unused public and private lands, ditches and water bodies. Thus this study will try to shed light on the overall conditions and try to come up policy options and strategies to tackle the issue.

Methodology

In this study I intend to explore why public private partnership is necessary for enhancing urban governance and tried to show how PPP helps to reduce cost and improve service delivery. In this respect, both qualitative and quantitative data have been used. Nevertheless, qualitative methods are considered the dominant design for the study. This study therefore used the

.Case study as the researcher I talked with various stake holders of DCC and sometimes observed their activities , sometimes mixed with them as a member of their group. I interviewed different officials and workers of Public and private organizations. Have also been interviewed. Using open and closed end questionnaires

Limitations:

The major problem that I encountered at the initial stage of my fieldwork was to make the term public private partnership and urban governance understand to my respondents. Because it is relatively a new term used in development research and little work has so far been done in Bangladesh using PPP as an analytical tool. In order to overcome the problem, I had to define PPP and Urban governance and discussed the major analytical aspects. For my respondents, I used suitable local words (i.e. *moila/abarjana*) for expressing the inherent meaning of solid waste .

At the time of doing the interviews, in some cases, I was not allowed to make a face-to-face interaction with the Head of the private organization because of the so called bureaucracy. In some cases I asked questions to the staff and he /she answered in favor of the organization.

It was a difficult task to reach with the Head of the private organization than to the civil servants for holding interviews with them, as their tendency was to escape in the name of their 'busyness'. In spite of all the hurdles, I managed to talk to them and received some documents related to my work. This has been quite frustrating as this type of behaviour is expected from private sector.

CHAPTER OUTLINE :

This study will have the following overall structure

Chapter-1 –Introduction

Chapter-2- Concepts, Issues. Models of SWM .

Chapter-3 The Global and local Scenario of SWM .

Chapter-4 Solid Waste Management in Dhaka City

Chapter-5 Analysis and Conclusion

Chapter – 2

Concepts, Issues. Models of SWM

Introduction: This chapter is focused on good governance and good urban governance initiatives. Principles of good governance and good urban governance are also discussed and tries to relate between this two issues. Then it broadly focuses on solid waste management that means what it is, some definitions and some conceptual issues regarding solid waste management. The discussion also encompasses Urbanization and focuses on it in the light of global and local perspective. It also relates urbanization with solid waste management. Lastly focus is also given on public private partnership with some relevant theories

Before discussing solid waste management linked with urban governance, it would be logical to focus on the concept of 'governance' which is a crucial ingredient of urban authority. What exactly is governance? The term 'Governance' is derived from the Greek word 'kybernan' and 'kybernetes'. It means '*to steer and to pilot or be at the helm of things*'. The concept of governance is complex and controversial. There are some common points of departure, however, first, governance is not government. Governance as a concept recognizes that power exists inside and outside the formal authority and institutions of government. Second, governance emphasizes 'process'. It recognizes that decisions are made based on complex relationships between many actors with different priorities. However, to grasp the full understanding of governance issues we should first differentiate between government and governance.

While, Government is described as the repository of confidence and power of the people delegated by them for a fixed period of time for the express purpose of identifying, mobilizing, organizing, guiding and directing all available resources, human and other, to facilitate planned and participaton transformation of their society towards enhanced well-being of its people, via just enjoyment of all its needs, rights, aspirations and sustainable peace (www.unescap.org).

Governments are necessarily political regimes pursuing a course of development action that they consider as most suited within the construct and form of their society and its constitution. Government comprises the constitution & laws, institutions & structures, management mechanisms & administrative processes. These are devolutionary instruments that make a government participatory and responsive to common citizens.

Governance, on the other hand, is the sum of cumulative practice of behavior and attitude of the government as seen in the manner they create and use the said devolutionary instruments. Form, style, systems, methods, and procedures of government generally reflect the pattern of governance in a nation or city. The quality and effectiveness of governance depend mostly on how judiciously the government uses the said instruments to help people achieve the ultimate goal of their progress - justice, equity and peace.(www.unescap.org).

Good Governance Initiatives

Since the early Nineties, the United Nations has pointed out that member countries of the UN need to pay greater attention to the way their government systems and procedures have been operating in order to ensure that there exists good governance. They introduced the term 'governance' in the development vocabulary and made a conscious effort to popularize the concept of good governance. Their policy papers on Governance were explicit and inviting. Today, the concept has gained currency in many development arenas and agencies and nations have begun to work on improving their governance(www.unescap.org).

Some noteworthy definitions of 'governance' come from the World Bank, UNDP,OECD and The Commission of Global Governance. 'The World Bank has identified three distinct aspects of governance: (i) the form of political regime; (ii) the process by which the authority is exercised in the management of a country's economic and social resources for development; and (iii) the capacity of governments to design, formulate and implement policies and discharge functions.' (World Bank 1999:95)

'Governance is viewed as the exercise of economic, political and administrative authority to manage a country's affairs at all levels. It comprises mechanisms, processes, an institutions through which citizens and groups of articulate their interests, exercise their legal rights, meet their obligations, and mediate their differences.' (UNDP 1997:1)

'The concept of governance denotes the use of political authority and exercise of control in a society in relation to the management of its resources for social and economic development. This broad definition encompasses the role of public authorities in establishing the environment in which

economic operators function and in determining the distribution of benefits as the nature of relationship between the ruler and the ruled. (OECD 1995:45).

According to the Commission on Global Governance. 'Governance is the sum of the many ways individuals and institutions, public and private, manage their common affairs. It is a continuing process through which conflicting or diverse interests may be accommodated and co-operative action may be taken. It includes formal institutions and regimes empowered to enforce compliance, as well as informal arrangements that people and institutions either have agreed to or perceive to be in their interest' (Commission on Global Governance 1995:12).

From the above definitions ,it can be summarised that good governance is both a goal and a process. And it can help us find solutions to poverty, inequality and insecurity. It creates an environment in which civil organizations, business community, private citizens and other institutions can assume ownership of the city development process and the management of their communities. There are three main actors involved in good governance. They are (1) .the State, (2) .the Civil Society and (3) .the Private Sector.

.The State provides the foundation of Justice, Equity and Peace, creating conducive political and legal environs for human progress. The Civil Society provides the foundation of Liberty, Equality, Responsibility & Self-expression. The Private Corporate Sector provides the foundations of economic growth and development. The three regimes carry out these responsibilities by performing multifarious tasks (www.unescap.org).

So it can be concluded that Governance is the cumulative result of the interactions among the three regimes in society's political, economic and administrative domains.

Good Urban Governance

The idea of good urban governance came from UNDP's The Urban Governance Initiative (TUGI) and UNCHS' Urban Observatory Project. More recently, the latter has also launched a Global Campaign for Good Urban Governance. The UN-HABITAT proposes the following definition of urban governance:

Urban governance is the sum of the many ways individuals and institutions ,public and private, plan and manage the common affairs of the city. It is a continuing process through which conflicting or diverse interests may be accommodated and cooperative action can be taken. It includes formal institutions as well as informal arrangements and the social capital of citizens. Thus, UN-HABITAT's operational experience confirms that it is not just money, or technology, or even expertise, but also good governance that means the difference between a well-managed and Inclusive City and one that is poorly managed and exclusive(www.unhabitat.org) .

:

Urban governance is inextricably linked to the welfare of the citizenry. Good urban governance must enable women and men to access the benefits of urban citizenship. As it is based on the principle of urban citizenship, it affirms that no man, woman or child can be denied access to the necessities of urban life, including adequate shelter, security of tenure, safe water, sanitation, a clean environment, health, education and nutrition, employment and public safety and mobility of resources.

Principles of Good Urban Governance

The UN Habitat Campaign proposes that good urban governance is characterized by sustainability, subsidiarity, equity,efficiency, transparency and accountability, civic engagement and citizenship, and security(www.unhabitat.org) and that these norms are interdependent and mutually reinforcing. Sustainability should be there in all dimensions of urban development. Subsidiarity of authority and resources to the closest appropriate level. Responsibility for service provision should be allocated on the basis of the principle of subsidiarity, that is, at the closest appropriate level consistent with efficient and cost effective delivery of services.

Equity of access to decision-making processes, provision of services and the basic necessities of urban life. The sharing of power leads to equity in the access to and use of resources. Women and men must participate as equals in all urban decision-making, priority-setting and resource allocation processes.

Efficiency must be there in the delivery of public services and in promoting local economic development. There should be transparency and accountability of decision-makers and all stakeholders in their actions and decisions. It must be stressed here that the accountability of local authorities to their citizens is a fundamental tenet of good governance.

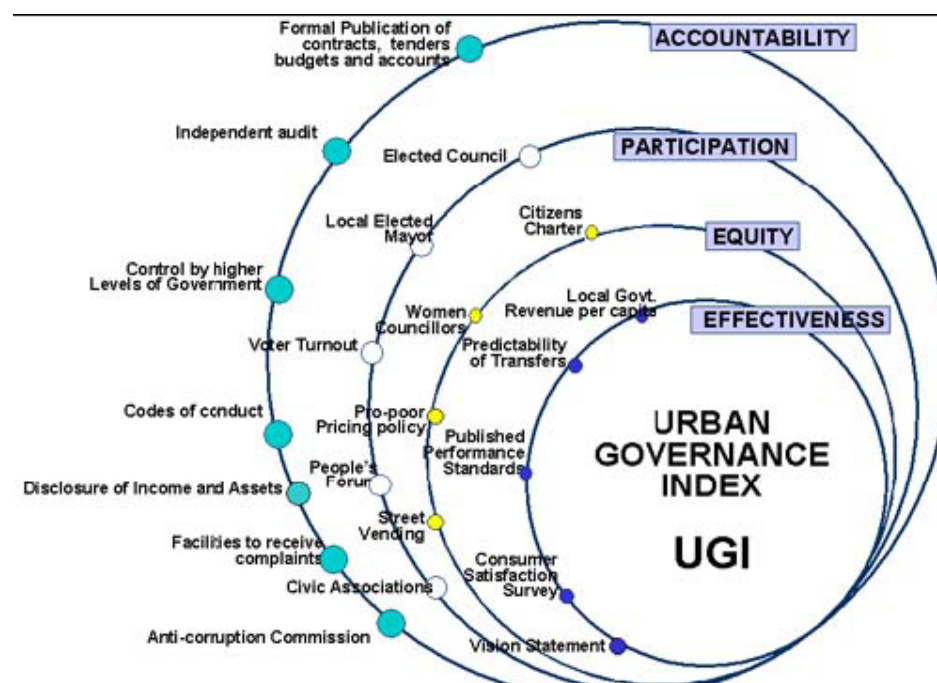
The Habitat also stresses for civic engagement and citizenship as people are the principal resources of cities; they are both the object and the means of sustainable human development. Therefore, their rights as citizens and their continuous engagement in processes and policies affecting their lives must be ensured. Lastly, security of individuals and their living environment. Every individual has the inalienable right to life, liberty and the security of person. Security also implies freedom from persecution, forced evictions and provides for security of tenure. Cities should also work with social mediation and conflict reduction agencies and encourage the cooperation between enforcement agencies and other social service providers (health, education and housing).

The Urban Governance Index:

The Urban Governance Index is an advocacy and capacity-building tool to assist cities and countries in monitoring the quality of urban governance(www.unhabitat.org). Envisaged to be a measure of good governance and inclusiveness in cities, the Index has been field tested in 24 cities across the world.

The Index is being adapted and applied in several countries, including Somalia, Sri Lanka, Zimbabwe and Mongolia. It provides the description of 25 short-listed indicators, which also include the 18 core set of indicators. The indicators are grouped in sub-indices covering the core urban governance principles of Effectiveness, Equity, Participation and Accountability. The figure no.1 below gives an idea about the Index.

Figure:1



source: www.unescap.org

The different characteristics of the Index are discussed below:

Effectiveness

1. Local government revenue per capita

It has been defined as the total local government revenue (income annually collected, both capital and recurrent for the metropolitan area, in US dollars) per capita (3 year average).

2Ratio of actual recurrent and capital budget

It is the assessment of the distribution of local government budget sources. Ratio of income derived on a regular basis (e.g. through taxes and user charges) and that obtained from allocation of funds from internal or external sources.

3. Local government revenue transfers

It means the percentage of local government revenue originating from higher levels of government. This includes formula driven payments (such as repatriation of income tax), other grant donations from higher government levels including national or state governments and other types of transfers.

4. Ratio of mandated to actual tax collection

Ratio of mandated tax collected to the actual tax collected. Tax collection is one of the sources of income for the local government.

5. Predictability of transfers in local government budget

It indicates whether the local authority know well in advance (2-3 years) about the amount of budget and level of consistency/regularity in receiving transfer from higher government?

6. Published performance delivery standards:

Presence or absence of a formal publication by the local government of performance standards for key services delivered by the local authority.

7. Consumer Satisfaction Survey

Existence and frequency of a survey on consumers' satisfaction with the local authority's services.

8. Existence of a vision statement:

This means the measure of local authorities commitment in articulating a vision for the city's progress. Does the local authority articulate a vision for the city's future through a participatory process?

Equity

9. Citizens' Charter: right of access to basic services:

Presence or absence of a signed, published statement (charter) from the local authority which acknowledges citizens' right of access to basic services.

10. Percentage of women councillors in local authorities:

10. Women councillors as a percentage of the total number of councillors in a local authority (in the last election).. Percentage of women councillors in key positions

11. Pro-poor pricing policies for water

Presence or absence of a pricing policy for water which takes into account the needs of the poor households, which are then translated into lower rates for them compared to other groups and prices applied to business/industrial consumption.

12. Incentives for informal businesses

1a. Presence of particular areas in the central retail areas of the city where small scale (informal) street vending is not allowed (or submitted to particular restrictions).

1b. Also measures the existence of incentives for informal businesses e.g. street vending, informal public markets, and municipal fairs.

Participation

13. Elected council:

The indicator measures whether the local governing council is elected through a democratic process or not.

14. Selection of Mayor

The indicator measures how the Mayor is selected, whether directly elected, elected from amongst the councilors or directly appointed.

15. Voter turnout

Total voter turnout (both male and female) in percentage in the last election

16. Public forum

The public forum could include people's council, city consultation, neighbourhood advisory committees, town hall meetings etc.

17. Civic Associations per 10,000 population

Measured as the number of civic associations (registered) per 10,000 people within the local authority's jurisdiction.

18.Accountability

Formal publication (contracts and tenders; budgets and accounts):

Existence of a formal publication (to be accessible) by the local government that consists of contracts, tenders and budgets and accounts.

19.Control by higher levels of government

Measures the control of the higher levels of government (National, State /provincial) for closing the local government and removing councilors from office.

20.Codes of Conduct:

Existence of a signed published statement of the standards of conduct that citizens are entitled to from their elected officials and local government staff.

21.Facility for citizen complaints

The existence of a facility established within the local authority to respond to complaints and a local facility to receive complaints and information on corruption.

22.Anti-corruption Commission

Existence of a local agency to investigate and report cases of corruption.

23.Disclosure of Income/Assets

Are locally elected officials required to publicly disclose their income and assets (and those of their immediate family) prior to taking office?

24.Independent audit

Is there a regular independent audit of municipal accounts, the results of which are widely disseminated?

Management of Solid Waste:

The term Solid waste is applied to unwanted or discarded waste material from houses, street sweeping, commercial, industrial and agricultural operations, arising from human being's activities. In urban area it is called refuse; in the countryside it is called littering and in general, it is called solid waste. It is a conglomeration of dust, ash, vegetables and putrescible matter, paper and packing of all kinds, rags and other fabrics, glass and much other combustible and non-combustible debris. It is non-liquid, non-soluble materials ranging from municipal garbage to industrial wastes that contain complex and sometimes hazardous substances. Solid wastes also include sewage sludge, agricultural refuse, demolition wastes, and mining residues. Technically, solid waste also refers to liquids and gases in containers (www.njhazwaste.com/glossary.htm).

According to World Health Organization(WHO),” solid waste is defined as useless, unwanted or discarded materials and is not free flowing. Solid waste is the term now used internationally to describe non-liquid waste materials arising from domestic trade, commercial, industrial, and agricultural as well as from public sector.

In case of urban areas Municipal Solid Waste (MSW) can be defined using Chapter 21.3 of **Agenda 21** of United Nations Conference on Environment and Development of 1992¹

Solid wastes...include all domestic refuse and non-hazardous wastes such as commercial and institutional wastes, street sweepings and construction debris. In some countries the solid wastes management system also handles human wastes such as night-soil, ashes from incinerators, septic tank sludge and sludge from sewage treatment plants. If these wastes manifest hazardous characteristics they should be treated as hazardous wastes. (www.unep.org)

Municipal solid waste (MSW), also called urban solid waste, is a waste type that includes predominantly household waste (domestic waste) with sometimes the addition of commercial wastes collected by a municipality within a given area. They are in either solid or semi-solid form and generally exclude industrial hazardous wastes. The term *residual waste* relates to waste left from household sources containing materials that have not been separated out or sent for reprocessing²

¹ United Nations Conference on Environment and Development, Rio de Janeiro, June 14, 1992 Chapter 21 "Environmentally Sound Management of Solid Wastes and Sewage-related Issues"

MSW is thus seen as primarily coming from households but also includes wastes from offices, hotels, shopping complexes/shops, schools, institutions, and from municipal services such as street cleaning and maintenance of recreational areas. (http://en.wikipedia.org/wiki/solid_waste)

There are five broad categories of MSW:

1. Biodegradable waste: food and kitchen waste, green waste, paper (can also be recycled).
2. Recyclable material: paper, glass, bottles, cans, metals, certain plastics, etc.
3. Inert waste: construction and demolition waste, dirt, rocks, debris.
4. Composite wastes: waste clothing, Tetra Paks, waste plastics such as toys.
5. Domestic hazardous waste (also called "household hazardous waste") & toxic waste: medication, e-waste, paints, chemicals, light bulbs, fluorescent tubes, spray cans, fertilizer and pesticide containers, batteries, shoe polish (www.wikipedia.org).

Solid Waste Management

Management and disposal of solid waste is known as solid waste management (SWM) and it has different dimensions. The ancient Hindu culture has made a deep sense of belonging to the Waste Management concept. It says, “Lawanam Samudra Davatayoh, Phalam Vanaspati Devatayoh, Pakwanam Vishnu Devatayoh, Jalam Varun Devatayoh” meaning “Salt belongs to Ocean, Fruits belong to Botanical World, Sweets belong to Lord Vishnu, and Water belong to Neptune. Similarly, Gautam Buddha in his teachings referred to the reuse of the Saffron robes Chibar as bed cover, pillow cover, sitting mat, and foot wrap and finally as floor wipe. Islam says, “Kullu Saiya Yarju Ila Islahi” meaning Send Back To Its Source of Origin”. Thus, waste management was part of the traditional societies following the Nature where there is no waste material that creates environmental hazard. Every thing is perishable. Every thing is recycled back to its origin - the Panch Mahabhuta Tatwoh (the five fundamental elements): the Earth, Water, Fire, Sky, and Light. (International Conference on Sustainable Solid Waste Management, 5 - 7 September 2007, Chennai, India. pp.552-559)

SWM includes Resource recovery, re-use, recycling. Resource recovery includes all activities of waste segregation, collection and processing which are carried out taking into consideration the

economic viability of the material (Cointreau 1984:14). Re-use and recycling provide an opportunity to capture some of the values from the waste. Of these two techniques, reuse is a simpler process involving reutilisation of material in its end -use form without the necessity of reprocessing. Recycling, on the other hand, involves processing waste through remanufacture and conversion of parts in order to recover an original raw matter .

In the modern day perspective, the practical dimensions of solid waste management includes collection, treatment and disposal of solid waste. However, SWM is related with other tangible and intangible factors and if these factors are addressed properly , SWM can be sustainable and enhance urban government's capabilities. The related factors are environment, health, community, education, finance, technology, governance, policy and regulation.

Figure No. 2



Source: (JICA 2005:34)

Theoretical Background of Solid waste Management :

The concept of "Sustainable Development" was first introduced by IUCN(International Union for the Conservation of Nature and Natural resources) in 1980 in a report on "World Conservation Strategy: Living resources Conservation for sustainable Development". According to the report "Sustainable Development" means improving the quality of human life while living within the carrying capacity of the supporting ecosystems". In 1987, Brundtland Commission introduced a new definition in its report " Our Common Future". According to this Commission, sustainable development has two aspects, one is " meeting the needs of present generation" and another theory is " doing something for the future generation".

This statement provides a clear implication for environmental agenda particularly waste disposal in Dhaka City. In Dhaka the Dhaka City Corporation (DCC) is the formal authority to collect and disposal of solid waste. So question can be raised whether that DCC is capable enough to ensure sustainability of solid waste management or not.

Evolution of Solid Waste Management

The concept of solid waste management (SWM) developed gradually over time. In many European countries in the 1660s, burial in cotton or linen shrouds was banned to allow more cloth for papermaking. In USA in the nineteenth century, the first combined waste incineration and electricity scheme began after years of mainly dumping wastes in the Atlantic Ocean, polluting the beaches, resulting in protests by the resorts on the shores of New Jersey and New York. Then in 1894, a programme of source separation was implemented for disposal, whereas the separation of wastes at the source allowed the city to recover some of the collection costs through the resale and reprocessing of materials.

In the early part of the last century, an ethnic minority in Egypt, the Zabbaleen, was one of the world's first communities to integrate recovery and recycling of municipal waste. It was the environmental movement in the late 1960s, which formally presented integrated Solid Waste Management concept as a guiding principle for managing the refuse. Since then this notion was widely implemented mostly in the industrialised countries of the world..

Millennium Development Goals & Waste Management

The Millennium Development Goals of the UN have focused on waste management issues very strongly. Particularly, Chapter 20 deals with environmentally sound management of hazardous wastes, Chapter 21 with environmentally sound management of solid wastes and sewage-related issues, While Chapter 22 with safe and environmentally sound management of radioactive wastes.

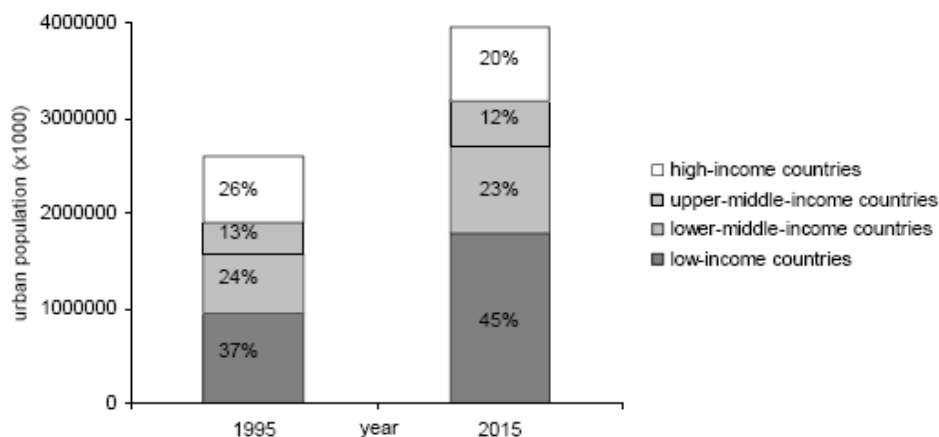
International Standard Organization 14001

The International Standard Organization (ISO) promotes the development and implementation of voluntary international standards, both for particular products and for environmental management issues. ISO 14000 refers to a series of voluntary standards in the environmental field including ISO 14001 related to Environmental Management Systems (EMS) and other standards in fields such as environmental auditing, environmental performance evaluation, environmental labeling, and life-cycle assessment. The ISO 14001 standard requires that a municipality, community or organization put in place and implement a series of practices and procedures that, when taken together, result in an environmental management system.

Urbanization and Urban Waste Management:

Rapid urbanization is taking place especially in low-income countries. Globally, in 1985, 41 percent of the world population lived in urban areas, and by 2015 the proportion is projected to rise to 60 percent (Schertenleib & Meyer 1992:32). Of this urban population, 68 percent will be living in the cities of low-income and lower middle - income countries.

Figure:3 Urban population



SOURCE: (

Zurbrugg 2002:2)

The global urban data for the year 1995 (World Resources Institute, 1997:89) shows that approximately 65 percent of the urban population in the developing world still live in cities with populations smaller than 750'000. Many of these "smaller" cities are facing urban environmental management problems where appropriate approaches are sought now, before the cities' urban environments deteriorate any further. The situation is becoming even more acute, as data shows that slums are growing at an alarming rate and as mentioned above it is especially in the urban poor areas where the municipal solid waste management service is lacking behind the needs of the inhabitants (UNEP 2000:5).

Urbanisation: Global Perspective

Two hundred years ago only five percent of the total population of a country used to live in the urban area. In 2000 about fifty percent of the total world population has migrated from rural areas to urban areas. About fifty five percent of the worlds population will be urban dwellers by 2015(Imura and Bai,2000:135-136r).

Table 1: Percentage of Urbanization of World Population

Zone	1990	1995	2000	2005	2010	2015	2020	2025
Whole world	43.1	45.2	47.6	50.1	52.1	55.6	58.5	61.2
Developed world	72.7	74.2	75.8	77.4	79.1	80.8	82.4	83.8
Under developed world	34.3	37.2	40.3	43.5	46.8	50.1	53.5	56.7
Asia	31.2	34.0	37.1	40.4	43.8	47.3	50.9	54.4

Source: (Islam 2003:23)

The above table shows the upward trend of urbanization from 1990 to 2025. Increase of urbanization although highest in the developed countries, this trend is lowest in the Asian cities. The figure of 2005, show that the average urban population in the Asian countries is 40.4 percent against the worlds average of 50.1 percent and developed countries's average 77.4 percent. It predicts that the trend of urbanization will remain unabated in the decades to come. The city authority must ready to face the upcoming challenges due to rapid urbanization.

Urbanization : Local perspective

Bangladesh is a developing country with about one and fifty million people in the area of 148,300 sq.km. The density of population stands at 881(BBS 2003:12) per sq. km. which is the highest in the world except city states like Singapore and Hong Kong. On a per capita basis, it is three times more populated than India and seven times more populated than China (Newton et al.1996:41). Basically Bangladesh is a rural based country. Agriculture used to play and is still playing a dominant role in the total economy of Bangladesh. After independence, the economy of Bangladesh started centering at the urban places in all sectors like business, trade and commerce and industry. As Dhaka is the centre of all development activities, it opens up new job opportunities and other facilities for all classes of people. As a result only agriculture could not hold up the expanded population at the rural areas.

A very big portion of rural migrated people of Bangladesh belongs to labor class. Of the seven percent migrated people about six percent are poor. About 4.2 millions live in the slums in the capital city contributing many odds including mal-management of municipal solid waste (World Bank,2007:25). The slum dwellers comprise about 41 percent of the total population of the cities and of Dhaka in particular. They are socially and economically deprived persons. Most of them do not have access to clean water, proper sewerage system, gas , electricity and other civic services. Their households are not come under DCC's tax net. They do not have to pay any holding tax to the municipal authority. But they generate solid waste nothing to pay for its disposal. So municipal authority does not provide civic services to them. As a result, they become the worst victims of environmental pollution caused by unattended solid waste.

Table-2: Urbanization in Bangladesh

Bangladesh				Dhaka	
Year	Total Urban population	Percentage of urban population	Average annual growth rate	Population	Average annual growth rate
1901	702035	2.43	-	-	1.04
1911	807024	2.55	1.39	154	1.8
1921	878480	2.64	0.85	169	0.9
1931	1073489	3.02	2.00	196	1.5
1941	1537244	3.66	3.59	296	4.2
1951	1819773	4.33	1.69	336	1.3
1961	2640726	5.19	3.72	557	5.2
1974	6273602	8.78	6.66	1774	10.4
1981	13228163	15.18	10.66	3440	8.1
1991	20872204	19.63	4.56	6844	6.5
2001	28605200	23.10	3.15	10170	4.5

Source: (BBS 2001:23 and Islam 2005:32)

The above table shows upward trend of migration from the rural Bangladesh to the urban places across the country. The increase of urban population by 8.78 percent in 1974 against 4.32 percent in 1950. It is a big jump of migration in the urban areas in 1974. According to the table in 2001, the urban population has been 23.10 percent of the total population of Bangladesh, which is nine times higher than the figure of 1901 and nearly three times higher than the figure of 1974. It is a clear upward trend of urbanization in Bangladesh after independence. Since then the trend of urban population growth has marked very high in every decade. The rapid growth in population in the urban places specially in Dhaka city is evidently responsible for producing more municipal waste.

Urbanisation and Waste Mangement

Asian cities are home to more than one billion people today. However, it projected that by 2025, Asia will be inhabited by more than four billion people - half of them in cities - and will produce more than 180 million tonnes of municipal solid waste (MSW) per day. The amount of waste is rising to levels that are both difficult and costly to manage. The Asian Development Bank (ADB 2000:8) estimates that urban authorities in Asia spend 50 percent to 70 percent of their total revenues on waste management.¹ In a separate study by the World Bank 2000, neglect of the environment is calculated to cost an average of 5 percent of gross domestic product (GDP), while government spending on environmental protection amounts to less than 1 of GDP! (3R practice in east and south-east Asia, Waste Management World - September, 2007, Page-1)

As economic prosperity increases, the amount of solid waste produced consists mostly of luxury waste such as paper, cardboard, plastic and heavier organic materials. In cities in the south, on the other hand, waste densities and moisture contents are much higher (Cointreau et al.1984:54)

In addition, the hazardous content is quite high since the regulatory and enforcement system to control such waste disposal are usually non-existent or not operating (Cointreau & Levine 1997:57). This is a particular problem with waste from hospitals located within the city area, which is often found mixed with municipal waste in open dumps and landfills.

These differences mean that waste management systems each require distinct approaches. For example, as the waste content in developing countries is highly organic and susceptible to rapid decay, the emphasis of the SWM process in these countries should be on the collection process.

Table 3. Economic development, urbanization and municipal solid waste generation

Country	Level of economic development (GDP per capita US\$)	Level of urbanization (% of urban population)	MSW generation (kilotons/year)	MSW generation per capita (kg/capita-day)
Singapore	23,052	100.0	-	-
Malaysia	3,915	57.4	-	0.88-1.44
Thailand	2,012	19.8	14,317	0.62
Philippines	989	58.6	10,670	0.50-0.70
China	856	35.8	130,320	1.70
Indonesia	710	41.0	-	0.76
Vietnam	401	24.1	-	-
Laos	328	19.3	-	-
Cambodia	256	16.9	-	-

Source: Asia-Pacific in Figures, 2004 <http://www.unescap.org/stat/data/apif/index.asp> for GDP per capita, UNCHS, 2003 for level of urbanization; and Terazono et al., 2005 for MSW generation and per capita generation.

The Idea of Partnerships in SWM

Partnerships can be analyzed at different levels: politically as 'institutions' of governance; at the planning level as instruments for public policy; sociologically as forms of social capital; and economically as ways of reducing transaction costs. They include several dimensions: values, processes, and institutions (Emura *et al.* 2005:357-358).

There are a number of definitions of partnerships pertaining to urban governance . For my study I use the following definition of partnerships:

1. It involves two or more actors, necessarily a public sector actor;
2. It refers to a more or less enduring relationship between the actors - based on a written or verbal agreement - regarding public goods provision;
3. There are benefits for all actors without assuming equality or equal benefits
4. It is realised in concrete activities, in which each actor invests materially or immaterially;

5. The bargaining process can include potential areas of tension and conflict as well as cooperation;
6. The partnership concerns the provision of public goods, or a spin-off relating to a public good.

Types of partnership arrangements in SWM

Public-private partnerships have received the most attention internationally and raise issues of public interest and acceptability. Advantages are said to be savings on costs, less political interference, and lower levels of coercion (Ali 1993:12).

Governments generally privatize SWM activities to large-scale, formal enterprises. There is an emphasis on strong contractual arrangements, which largely excludes informal businesses and communities from qualifying. Although their potential is increasingly acknowledged, few governments include them.

Public Private Partnerships in environmental management have been encouraged by the United Nations Global Compact, and Millennium Development Goals and at the World Summit on Sustainable Development in Johannesburg in 2002. Local involvement in public-private partnerships has also been urged as a means of overcoming some of the political standoffs in implementing global environmental agreements, such the UN Framework Convention on Climate Change (1992) and its Kyoto Protocol (1997). Under the Kyoto Protocol, the Clean Development Mechanism (CDM) was established to allow countries with specific greenhouse gas reduction targets (the so-called Annex I countries) to achieve some of these targets by investing in climate-friendly activities in countries that do not have these targets (non-Annex I countries, which are usually developing countries).

Before going to broad discuss about the theme, We should know what is PPP?

PPP is :

- A common strand of public policy with better efficiency promised.
- A governance tool involving a long term contract between govt and third parties.
- A growing model of NPM.
- It offers financial, technical opportunities and creates new collaborative platforms for ensuring efficient, responsive service delivery of public sector.
- widely used for design, construction, financing and operation of public infrastructure

Public Private Partnership is the working arrangements based on a mutual commitment between a public sector organization with any organization outside of public sector” (Bovaird, 2004:199).

PPP is an institutionalised form of cooperation of public and private actors, which, on the basis of their own indigenous objectives, work together towards a joint target (Nijkamp et al., 2002.).

- Partners of PPP:
- public Sector Partners
- National government
- District administration
- Municipal authorities
- Local government bodies
- State run Corporations
- State universities and
- research organizations
- Private Sector Partners
- Commercial for-profit enterprises
- Development-focused voluntary
- non-governmental organizations
- (NGOs)
- Cooperative societies
- Community-based organizations
- Religious organizations
- Professional organizations
- Trade unions
- Research and academic
- Institutions
- Households
-

Forms of PPP:

There is no specific form and size of PPP that fits for all. The UN's "Global Partnerships Initiatives" is an excellent form of PPP. In general, PPP attempts to bridge the gap of understanding and trust between the public and private sectors and the following forms are used:.

:

BOOT: Build Own Operate Transfer

BTO: Build Transfer Operate

BOO: Build Own Operate

BBO: Build Buy Operate

Public Private Partnership Approaches in Solid Waste Management

SWM emerged as an essential, specialized sector for keeping cities healthy and livable.. The key elements required for PPP—a public sector with less than satisfactory efficiency and capacity, a private sector willing to undertake some parts of the activity, and the general public willing to pay the private sector for the extra service—are all present to some degree in most developing countries. “The public sector would be inclined to PPP because SWM consumes the majority of municipal budgets, and PPP may offer considerable savings. For instance, municipal corporations spend typically more than 60 percent of operations budget in primary collection” (Ali 1999:10-12). This cost can be partly offset by having partnership with the private sector. Municipalities also tend to suffer from chronic budget deficits, have much difficulty in expanding their work force, and have limitation in meeting public demand, all of which could further provide incentive for collaboration with the private sector. The people—the third tier—are willing to pay because they get better service and cleaner neighborhood. The private operators provide solutions that are appropriate, demand-responsive and low-cost.

Public private partnership approaches in solid waste management in India

Public Private Partnership for Solid Waste Management in Delhi:

Inception of PPP

Solid waste management in Delhi has been a very poorly planned affair with onus on simply transporting the mixed waste by trucks and disposing it in sanitary landfills (SLF). . Complete negligence of waste minimization and recycling over the years gave way to a whole lot of problems with disposal emerging as a major one. With commonwealth games round the corner, Delhi government in its attempt to overcome the grim scenario signed agreements with three private

companies for collection, segregation, transportation and disposal of municipal solid waste in six zones on January 31 2005(The Hindu, January 31st 2005).Aimed at increasing efficiency and effectiveness of its waste management activities, MCD planned this public private partnership project in six zones – City, South, West, Central, Karol Bagh and SadarPaharganj. The three agencies with which the civic body signed the “concession agreement” for the project are limited for south, central, and city zones, Noida basedAg Enviro infra projects (P) ltd. For Karol Bagh and Sadar Paharganj zones and Delhi based MetroWaste Handling (P) Ltd.(MWH) for west zone. The project proposed to be implemented in phaseswent fully operational in June 2005. The private companies were allotted a concession period of 9years inclusive of the implementation period of 12 months from the date of signing the agreement.The agreement also contained a performance evaluation and monitoring mechanism where the monitoring of the project was to be carried out by an independent engineer appointed by mutual consent of the corporation and the companies.

MSV Pvt. Ltd. was appointed as the independent engineer to monitor the project. In this study we have monitored the working and operation of Delhi based metro waste handling private limited, which is handling the collection, segregation and transportation of the solid waste in the west zone. The study shows the paradigm shift that has been brought about in the sphere of solid waste management with the advent of public private partnership. It specially focuses on the wastsegregation which was totally neglected during the MCD regime.

Scenerio after the inception of PPP

The system has undergone a huge transformation since the privatization. Compactor loaders are being used for the transportation of the waste. Containerized mechanical loading and unloading is done which avoids multiple handling, reduces spillage, ensures hygienic environment around the WSD'sand also reduces environmental and health risks. Moreover separate vehicles are used for biodegradable(green) and non-biodegradable waste(blue). A major chunk of the biodegradable portion is sent to a centralized composting facility. The whole transportation activity is managed by a fleet of34 vehicles including 16 compactors 9 mini Refuse Collectors(RCs) and 9 high capacity dump trucks operated by a total of 51 drivers and 72 helpers. The capacity of the vehicles varies between3m³ and 16m³. They are directly managed by a strong team of supervisors(including team leaders)which are 49 in number. The movement of the vehicles takes place according to the proper schedule and is tracked by a state of the art command and control system. Command and control communication devices comprise of 34 wireless sets on vehicles, 32 wireless handsets with

operational and technical staff and 50 cellular phones. Moreover, the on road movement of the vehicles is tracked by a special Global Positioning System (GPS) enabled system. 100 percent waste collection and disposal is ensured within 24 hours and is achieved in 3 shifts of 6 hours each. Breakup vehicles are also maintained to keep the stability of the system intact in the case of vehicular breakdown and also for handling

Scenerio before PPP



Scenerio after PPP

and dropped into these SCBs. However the responsibility of bringing the waste to the SCBs lies upon the waste generators. There is no door to door collection system. Minimum one SCB has been placed in an area of 1 sq.km. there are separate bins for wet and dry waste. The bins have been placed

after the consultation with the local residents. The bins are properly looked after and are repaired from time to time according to the requirement. The repair work is done at the Subhash Nagar central work.

Conceptual background of PPPs with reflection on SWM

Theories pertaining to PPPs help to understand the validity of this kind of partnership with solid waste management. Here we would present a review of relevant sociological, economic and management theories.

Sociological theories

Public private partnership for SWM may be viewed in light of sociological theories of Functionalism and general systems as elucidated by [Abuyuan \(1999:12\)](#). According to the functionalism theory institutions must survive by adapting to changing circumstances by means of interdependence on its various branches or partners. PPPs in SWM adapt to this theory well if we view the partners as parts of a whole organisation that delivers services. Here the partners (public and private) may be seen as interdependent organs of a larger organisation each having its specialised function working as a whole towards the common goal of delivering effective services.

The general systems theory analyses systems from three different viewpoints: (1) system to determine the nature of relationship between various components of a system; (2) system effectiveness to judge how satisfactory are relationships among various components of a system for the whole system to survive or make optimum use of resources; and (3) system dynamics to investigate what forces a system to change and the direction in which the change occurs.

This theory is also relevant to PPP for SWM. Indeed it is a prerequisite to have a clear role demarcation and defined relationship to make PPP work in the SWM sector. It is necessary that the private sector be given the role in which they have the maximum potential to excel. For example, the private sector has a comparative advantage over the public sector in the case of primary collection. Conversely, financial and management inputs for operating secondary collection may be beyond the capacity of most private sector agencies, and it may be better to leave this activity to the public sector.

Economic theory

In the private sector, people and commercial enterprises succeed by paying no more than necessary. Businesses pay the market rate—it pays no more than necessary for labour, supplies and capital. In contrast, government also procures goods and services from the market for providing public service, but market competitiveness is not applied. The result is higher cost. In recent decades there has been increasing concern about the cost of government, and at every level of government, there have been serious budget difficulties (Cox, 1996). Cox, W. (1996). Competitive contracting for more effective and efficient government. (www.publicpurpose.com). Meanwhile, an alternative economic arrangement has been emerging. A diminishing distinction between the public and the private sectors was noticed by Dahl and Lindblom as early as 1953 (Larkin, 1994:9).

Bozeman found the formation of hybrid organisations making the dichotomy of public and private sector even less distinctive. (Larkin, 1994:8) argued that these hybrid or ‘third sector organisations’ hold a great deal of promise for many of our domestic problems. These third sector organisations provide a means to combine the ‘efficiency and expertise’ from the business world with public interest, accountability and broader planning of government

The above concept is pertinent to PPP for SWM, as this is a basic service that must be provided to all citizens, and profit cannot be the main motive. The government and public agencies cannot completely withdraw from this sector because this has a public health and public good dimension. The question, therefore, is how to minimise the cost and maximise the resource utilisation, while maintaining the best possible quality of service. A hybrid or mixed organisation composed of both the private and public sector may offer such opportunity.

Management theories

To meet the needs of society three distinct sectors—public, private and non-profit—have emerged although their boundaries are not always completely distinct. Each of these sectors has its comparative advantage. Traditionally each sector used to restrict itself to its own sphere of activities. Lately, however, organisations have grown to realise that much value can be created by co-operating with others outside of its sphere. Aickenhead (1999:55) has investigated various theories of management to reflect upon public/private partnership, a summary of which is given below. Traditionally partnership among organisations occurred rarely and on a small scale. The perception of the business world has been one in which the players fight bitter battles, not satisfied with only winning but needing also to see others lose. But increasing demand, complexity and limitation of

resources have forced organisations to recast their views. They have begun to realize the importance of developing a collaborative advantage. It is often no longer possible to win when others are losing. The focus has shifted from 'win-lose' to 'win-win'. Are conditions right for PPP in the SWM sector in developing countries?

How PPP helps to enhance urban governance in the light of the above theories in SWM

According to the functionalism theory institutions must survive by adapting to changing circumstances by means of interdependence on its various branches or partner. If we absorb this theory in swm, we can view various branches as partners and adapt changing circumstances means facing challenges through urban innovations based on specialization. In swm in Dhaka city, primary collection is done by primary service providers such as CBOs NGOs,. On the other hand DCC does the secondary task that means waste carried to dumping site such as Matuail sanitary landfill, Amin Bazar land fill, Uttara landfill. Matuail is the only official site, the two other are private land. Before privatize conservancy works in zone 9 &10 DCC has to pay fifty three million taka in 2003 for secondary works. After introducing PPP, private partners did it with thirty six million taka that means saving sixteen million taka. If ppp allows in large scale in swm in other zones it would bring better output . Primary service providers have comparative advantage in primary collection as it already proved. On the other hand in secondary collection though DCC has comperative advantage seemingly but the private organization is learning by doing. So if opportunity should be rendered to private parties sothat they would reach at certain level of efficiency. SWM is a major challenge to urban authority which should be faced by the various parties by the means of interdependence.

Conclusion: Though present chapter deals with conceptual issues of SWM and PPP, the following chapter is written broadly focusing on global and local issues of swm specially developed and developing countries in Asia. It also shortly encompasses SWM in Bangladesh Perspective.

Chapter – 3

The Global and Local Scenerio of SWM

Introduction: This chapter is written on detailed observation of SWM that means conventional system of collection, transfer and cost of disposal in LDACs in Asia. Then it focuses on developed cities like Tokyo and Soul specially on the composition and treatment of SWM with resource recovery like energy recovery from incineration plants. Lastly it also focuses on SWM in Bangladesh and concerned legislations

Solid Waste Management: Global and Local perspective

Waste Management in developing cities in the world

Solid waste is a significant and growing problem in many urban areas of the developing world. Current systems of waste management in most developing country cities are not very satisfactory and are grossly inefficient and ineffective. Uncontrolled landfill, disposal of waste and open dumping are evident even in developing country cities where a waste collection service is not organized. There is also a general failure to keep industrial, municipal and sewage waste streams separated. It has been estimated that in India, for example, around 39 million tons of sewage and industrial waste, together with about 50 million of solid waste, finds its way into the coastal waters of the Arabian Sea and Bay of Bengal. Solid waste is also often dumped as landfill material in the coastal wetlands. This results in synergistic effects and intensified environmental damage and human health hazard.

In Mexico City it was estimated that 38 percent of the Federal District and 19% of the State of Mexico collection vehicle fleet were out of service at any particular time (Bartone, 1991:78). The result is that solid waste is routinely 'dumped' in the environment. Gutman's study of Reynosa in Mexico (Gutman, 1994:67) found severe pollution of the Escondida lagoon, once a mangrove area of tourist potential, partly because of illicit dumping of solid wastes.

Leachate pollution affecting surface water bodies and groundwater is also commonplace. Gutman (1994) suggests that perhaps 7 percent of Reynosa's population is exposed to considerable health hazards from solid wastes, and a further 25-33% face 'moderate' risks. The main risks are gastrointestinal and skin diseases, with an unknown serious element because the waste arisings include hospital and industrial waste. 20-40% of waste is not collected at all.

In some cities like Madras a large livestock population contributes to the sanitation and solid waste problems. According to a 1989 livestock census, there were over 30,000 cows and goats and more than 100,000 poultry within Madras City. Cointreau (1989) notes the very high cost of street cleaning in some countries. Thus in Thailand some 35-55% of recurrent costs of waste management are accounted for by street cleaning. Health inspectors tend to be few and over-stretched; with perhaps one inspector per 200,000 residents. Differences in street cleanliness between urban areas can often be accounted for by the political will of urban leaders.

Costs of disposal

Cointreau-Levine (1992) has suggested some benchmark figure for the costs of disposal in developing countries. These average costs are shown in the following table .Inspection of the data suggests that these are high estimates, particularly for low income countries. On the basis of these data, however, we can estimate some broad orders of magnitude for total disposal costs in developing countries. globally, the waste disposal industry may have a gross value of some \$37-77 billion, accounting for a fairly constant proportion of GNP at 0.2-0.5%.(Cointreau-Levine 1992:67)

Table: 4

Benchmark Costs for Municipal Waste Collection and Disposal (\$ per tonne)

Cost Items	Low Income	Medium Income	High Income
Collection	15-30	30-70	70-120
Disposal	1-3	3-10	15-50
Transfer	3-5	5-15	15-20
Total (Maximum)	19-38	38-95	100-190

Source: adapted from Cointreau-Levine (1992)

Table: 5

	Low Income	Medium Income	High Income
Urban population 10a	1.2	0.7	0.6
x Towns Waste Arising per Capita	0.2	0.3	0.6
x Collection Efficiency	0.5	0.7	1.0

= Total Tonnage	120 mt	147 mt	360 mt
x Collection + Disposal Cost	\$16-33t	\$33-80t	\$85-170t
= Aggregate Disposal Cost	\$1.9-4.0 b	\$4.8-11.8 b	\$30.6-61.2 b
GNP	\$1070 b	\$2413 b	\$16,279 b
Disposal Cost/GNP	0.2-0.4%	0.2-0.5%	0.2-0.4%

Source: calculations based on data in Cointreau-Levine (1992:25)

Cointreau-Levine (1992) notes that MSW collection and disposal may often absorb 20-50% of municipal government revenues in developing countries. The evidence from OECD countries is that private collection probably reduces costs by 10-40% (Cointreau-Levine, 1991:87) but the evidence for developing countries is unclear. Bartone et al. (1991) confirm significant cost reductions in Sao Paulo relative to Rio de Janeiro because of the introduction of private collections. In general there appears to be scope for private operators given that economies of scale appear not to exist in collection and disposal beyond a certain point.

SWM in Least Developed Countries

World Bank has categorized some countries as Least Developed Countries (LDCs) in terms of the following criteria: low-income, human resource weakness, and economic vulnerability. At present, 50 countries are designated as LDCs, out of which 8 countries are from Asia - Afghanistan, Bangladesh, Bhutan, Cambodia, Laos PDR, Maldives, Myanmar & Nepal. These countries have a number of priority issues pertaining to the country's development. Among those, management of municipal solid waste is one of the priority urban issues.

Although cities of LDACs have a lower rate of waste generation compared to the cities of the developing countries, their quantum of waste is high owing to their higher levels of population density. The tropical climates with a high degree of rainfall and humidity aggravate the problem of solid waste disposal. As cities are becoming more urbanized, their waste composition also changes..

shows the comparison of solid waste generated per capita (kg/day) in different LDCs and developing countries. It is observed that the generation rate ranges from 0.3 to 1.0 kg/capita/day.

Table:6 Solid waste per capita generated in LDACs

Name of LDACs	Solid waste per capita generated(Kg/day)
Bangladesh	0.5
Bhutan	0.3
Kabul	0.4
Cambodia	1.00
LaosPDR	0.75
Maldives	0.66
Myanmar	0.45
Nepal	0.5
Thailand	1.00

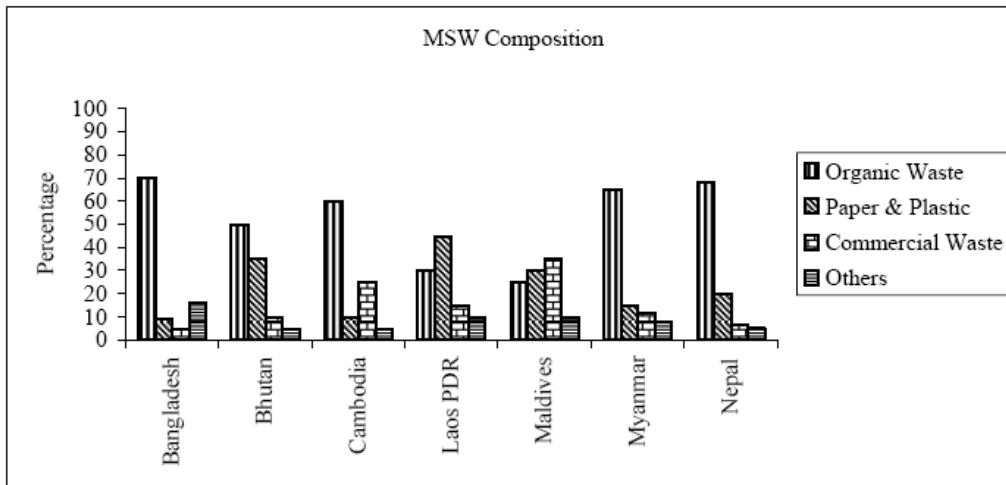
Source: Zurbrügg, Christian(2002:6)

A comparison of the current waste composition in LDACs (Zurbrügg, Christian 2002:8) shows that about 70% or more (by weight) of the waste is combustible (i.e. organics and paper).

The ratio of paper and and plastics including voluminous materials such as food containers and wrapping materials is higher in some countries where tourism industry is expanding; however organic waste is still the dominating factor in all of the countries being studied. In Bangladesh, the lower percentage of plastic is due to the restrictions of using thin plastics. Cambodia, with its slower urbanization growth, also has the same trend with Bangladesh in terms of paper and plastic wastes. Whereas, the low content of the organic material in Laos PDR is mainly due to the agricultural lifestyle where a large scale of the food waste is used as an animal feed. On the other hand, agricultural countries like Myanmar and Nepal, high percentage of their waste is organic, which is contrary to the waste in Maldives. In Maldives, with its rapidly developing construction industry,

which is contributing significantly to the composition of their waste, has also lower organic waste composition. This is similar to the situation in Kabul, Afghanistan where 50-60% of their waste content comes from construction debris or white waste.

Figure:4



Comparison of organic and inorganic components of MSW

Source: Zurbrügg, Christian(2002:6)

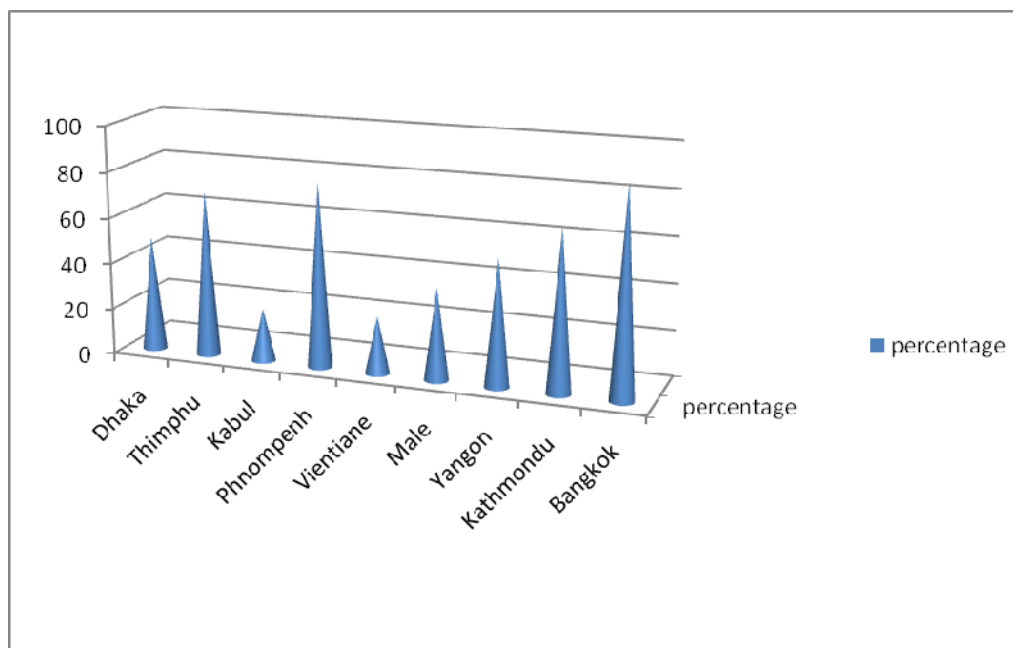
Collection and transport

Generally speaking, significant amount of the solid waste generated in urban centers are uncollected and either burned in the streets or end up in rivers, creeks, marshy areas and empty lots. Waste that is collected is mainly disposed off in open dump-sites, many of which are not properly operated and maintained, thereby posing a serious threat to public health

The collection rate varies from city to city and collection facilities are either inadequate or inefficient in almost all of the cities . Figure 5 describes the collection efficiency of various capital cities in Asia. Bangkok, being one of the fastest developing cities in Asia, exhibited the highest collection efficiency followed by Phnom Penh and Thimphu.

Figure: 5

Collection efficiency of LDACs



Source: Zurbrügg, Christian(2002:8)

MSW management services account for a high percentage of municipal budgets. Expenditure on MSW management can reach up to 40% of the municipal operating budget and, 70%-90% of this is spent on collection. For instance, Kathmandu spends 38% of the municipal budget on MSW management; 93% of this is spent on sweeping, collection, transfer and transport. In Phnom Penh, part of the collection service is performed by a private company, which demands the waste collection fee from households and directly deducted in their electricity bill.

Disposal of solid waste

Landfill

In most of the cities of LDACs, landfill is the most preferred method for the final disposal of solid waste. Most of these sites practice open dumping, with no regards to the requirements for a sanitary landfill. However, government and municipalities are already working to develop the sanitary landfill sites in few urban areas. Since land is fast becoming scarce within city limits, new sanitary

landfill are often too distantly located compared to the open dumpsites within municipal limits, thereby making the longer collection and delivery time,, which is ineffectively costly.

In many islands of Maldives organic wastes are composted at home backyards and non-biodegradable waste (such as plastics) is dumped near the beach or buried in a few islands. Burning of combustible waste at designated areas is also widely practice.

In Nepal, after the closing of Gokarna landfill site in 1994, the collected waste is just haphazardly dumped along the Bagmati river banks. In the case of Bangladesh,two land fills are exist.These are Matuail, AminBazar , The former is the only official site and recently it has been sanitized and the latter is private land fill.Fifty percent of total waste is collected and the disposed in these two land fill.The rest fifty percent is uncollected , which usually cause problem during heavy rainfalls and flooding.

Composting

Composting is the second preferred method of solid waste disposal in LDACs, mainly due to the high percentage of organic material in the waste composition. composting in bigger scale is not that popular in the whole region. The main reason why centralized composting plants are not functioning effectively includes (a) high operating and maintenance costs compared to open landfilling; (b) higher cost of compost than commercial fertilizers; (c) incomplete separation of materials such as plastics and glass, making the compost poor for agricultural application.

Recycling and recovery

Recycling is generally carried out by the informal sector. There are no policies that promote recycling or resource conservation, and the municipalities do not have the expertise to launch the recycling activities. In several places, such as Kathmandu, more of the waste could be recycled if there was better infrastructure for collecting recyclables.

In Cambodia, even though waste separation at the source is not practice, still some valuable waste is sorted out prior to collection and some done during the transportation. About 12% of the total wastes are collected from the household and from commercial areas by the informal groups for recycling.. In Bhutan, around 20% of the collected wastes are sent for recycling. Whereas, most of the recyclable wastes collected in Nepal and Bhutan are sent to India, due to insufficient recycling factories in the countries. In Bangladesh no formal recycling and recovery system is exist. Without any assistance of formal authority, about 12% wastes are re recycling and recovery by the waste Pickers.

Incineration

Due to the high capital, operation and maintenance costs involved for the installation of incineration plants, incineration is not popular as a waste disposal system in these countries .

In Afghanistan, due to inadequate incineration facilities at Kabul hospital, medical wastes are improperly disposed off haphazardly along the city streets. In Bangladesh, recently PPP approaches is applied in hospital waste management , yet the system is inadequate and working in a large scale.

The management of municipal solid wastes in LDACs has still many problems. The current regulation system is not perfect, and the existing management system and the collection facilities do not fit the present requirements at all. Government, NGOs, CBOs and private sectors are working hard in this field but still the action is not enough.

Overview of Municipal Solid Waste Management in Developed Countries:

Introduction

Per capita generation of municipal solid waste in the developed countries has increased threefold over the last two decades. It is predicted that waste generation in the developing countries will be doubling in the coming decade and global waste will be increased fivefold by 2025 (Brandsma 1997: 6-7). Indeed, how to resolve waste problem has become of enormous pressure for government policymakers. Even until a decade ago, however, major concern about waste problem had been such issues as reduction of waste generation itself and new facility. Here SWM in two developed cities in Asia like Tokyo and Seoul is focused.

Policy and Legislation regarding solid waste management all over the world

<u>Country</u>	<u>Name of Act or Law</u>
China	Law of prevention and control of sw
Indonesia	Government Regulation 12 of 1995
Japan	Waste disposal and Public cleansing law
South korea	Waste Management Act
Malaysia	Environmental Quality Regulations
Philippines	: Ecological solid waste management Act

Japan, Tokyo

Composition of MSW

As of 1997, the total amount of general waste collected in the ward area of Tokyo was 4 million tons, of which household waste accounts for about 46% (1.84 million tons) and waste from businesses occupies the rest (2.16 million tons). Of the waste collected by the Bureau of Waste Management, the TMG, 2.3 million tons are combustible (Of which waste paper occupies as much as 50%, kitchen garbage 29.9%, and so on) However, 8.1% of the total combustible waste is incombustible (plastics, rubber, and leather) or unfit for incineration (metal, glass, ceramics, etc), meaning that some of combustible waste has been separated incorrectly

Treatment of MSW

Until the early 1970s, the primary method of treating MSW in Japan was landfilling. However, from the mid-'70s, incineration became the most sanitary method as interim treatment to treat wastes. In Tokyo, as more wastes began to be processed by incineration than landfills from 1974, incineration rate sharply increased . As of 1998, the Bureau of Waste Management, TMG has 18 incineration plants and these facilities process 87.1% of post-recycling and 100% of the Bureau-collected combustible waste. Meanwhile, landfills receive less waste over time, and two landfills are currently in service to process about 13% of municipal waste from the ward area of Tokyo.

Although incineration rate is high, because of increasing pressures about environmentally sound waste disposal, rising disposal costs, and energy saving, recycling/resource recovery has become of the most attractive and desirable alternative for an eco-society with zero-emission that the Japanese government has pursued recent years

Composting is another attractive way of recycling. As for the kitchen garbage that accounts for 43% of household waste and about 22% of waste from business sector in 1997, households, restaurants, and municipal buildings are the main target. For example, in 1998, 90,161kg/day of food waste were generated from municipal buildings in Tokyo, and 14,722kg (or 16.3%) were composed. It is the TMG's goal to increase the composting rate of garbage from municipal buildings to 83% by the year 2000. Although households and businesses composting their garbage are increasing, the size is still small.

Policy Responses to the Waste Problem

a) Tokyo

.The TMG and the Japanese national government have implemented a variety of policy initiatives to address waste problem. In 1989, the TMG launched a campaign "Tokyo Slim" initiative for waste reduction and began to employ various educational and public information activities for encouraging citizens to minimize waste generation, such as "Long-term Vision for the Waste Management," "Public Incinerator Construction Plan," and "Action Plan for Waste Reduction (1991"Tokyo Public Cleansing Act" played the most active role in reducing MSW generation during the 1990s. In 1997, "The TMG Basic Plan for Urban Waste Treatment: Tokyo Slim Plan 21" was formulated by the TMG. It will be effective from 15 years from 1997 to 2011 as a guideline for waste treatment in the 23 wards of Tokyo.

Energy Recovery from Incineration Plants

a) Tokyo

As of 1999, there are 18 incineration plants in the 23 wards of Tokyo¹⁷, and these facilities processed 100 percent of combustible waste collected in the area. 18 incineration plants in the ward area of Tokyo. Major sources from incineration plants are heat energy and steam. Heat energy generated from incineration plants is used for supply to heated pools, bath water for the elderly, and so on

Seoul

Before and after 1990, the waste problem emerged as a potential crisis in Seoul. First of all, Seoul's per capita MSW generation was too much as compare to other mega-cities in developed countries. In 1992, Seoul generated 1.74kg of MSW per person per day, while Tokyo 1.34kg, New York 1.3kg, and London 0.9kg

. Seoul's population increased from 2.4 millions in 1960 to 10.9 millions in 1991, and the city's MSW generation jumped from 0.8 million tons in 1962 to over 11.6 million tons in 1991, 14.5 times increase as compared to about 3.7 times increase of population during the same period of time. This was largely due to rapid economic growth and urbanization during the period since waste generation generally responds to growth in population and economic activity as seen in Tokyo case. Daily per capita generation of MSW in Seoul also increased from 0.74kg in 1962 to 2.93kg in 1991.

In 2000, Seoul generated 11,339 tons of MSW per day, paper accounts for the largest portion (28%) of the total MSW generation, food waste 23%, plastics 7%, and so on. In Seoul, food waste is more problematic than paper or any other waste streams in terms of effective waste management in Seoul. Food waste contains a lot of water (80 to 85%) and is easily decayed, so it causes groundwater contamination when it is directly land filled. Food waste also consumes a lot of fuel for combustion. With these reasons, landfilling of food waste is supposed to be banned by Waste Management Act from 2005. Therefore, how to reduce and utilize food waste is a thorny issue of waste policy. As of 2001, there are two composting facilities with daily total capacity of 40 tons and four foddering facilities with totaled 270 tons capacity.

Classifying the total amount of 11,339 tons collected in 2000 into combustible, incombustible, and recyclable, each accounts for about 60% (6,839.6 tons), 5.7% (648.4 tons), and about 34% (1,946.5 tons),

Treatment of MSW

MSW treatment by processing type in Seoul: landfilling rate, which had accounted for almost 100% until 1990, decreased from 93.6 % in 1991 to about 50% in 2000; recycling rate increased from 6% to 44.5%; and incineration from 0.43% to 5.5% during the period. By the Recycling Promotion Act, all waste generators have to pay for their waste generation except recyclable materials. Also, recyclable materials, such as paper, bottles, steels, cans, and plastics, are separately collected. In 2000, 3,851 tons of materials and 1,197 tons of food wastes were recycled.

The Seoul city and the national governments recognized the nature of waste problem: building new waste facilities cannot be the primary option for managing MSW; rather it should be approached in comprehensive way. Integrated System of Waste Management¹⁴ was launched to address the dilemma. The Korean national government developed legislative initiatives such as the revision of Waste Management Act to promote recycling (September, 1991), the Volume-based Waste Collection Fee (January, 1995), and Separate Collection among others which every autonomous local district^(22 and now 25) had to construct incineration plant for the treatment of local waste generated in their jurisdiction. This 'do-it-yourself-principle,' however, faced more mounting opposition from local residents who live near the potential facility site¹³. This situation resulted in waste management policy deadlock and the war on waste in Seoul (Yoon 1996:35).

Volume-based Waste Collection Fee greatly contributed to reduce waste volume and amount and to promote recycling as seen in the previous sections. It also facilitated active citizen participation.

In Seoul, 10,971 tons/day of MSW were generated in 1999, of which combustible materials accounts for about 60 percent. Of it 78.9 percent of them went to landfill, and about 8% of combustible wastes and 4.8% of the total MSW generated were treated by incineration . Incinerators accept industrial wastes as well, but only minimum portion of them is processed by incineration. 1,746 tons/day of general industrial waste and 11,231 tons/day of construction waste were generated. 19.4tons (or 1.1%) and 22.5tons (or 2.9%) of each source were treated by incineration. 1.2% of combustible general industrial wastes and 0.7% of combustible construction wastes went to incineration plants. As of 1999, there are 27 incinerators in Seoul with totaled capacity of 52,975kg per hour. However, 25 of 27 facilities have small capacity with the 50 to 300kg per hour range, which treat as little as about 4% of the total waste treated by incineration in Seoul. Two plants (that is, Nowon and Yangchon)account for 94% of the total capacity and handle 96% of the total waste.

Energy Recovery From Incineration Plants in Seoul

Only Nowon and Yangchon plants produce heat. As in 1999, Nowon plant accepted 86,948 tons of waste and treated 79,936 tons, and Yangchon plant received 84,298 tons and processed 81,338 tons. Nowon plant was designed to treat 800tons/day (400tons for each furnace) and Yangchon 400tons/day, based on the amount of waste generation in the early 1990s. As mentioned, however, municipal waste generation reduced by almost 30% and recycling rate increased to more than 40%. The city and local district governments tried to take wastes from other districts, but it failed due to residents' opposition. As a result, both plants do not have enough waste to run their capacity. Only about 240tons/day of waste go to each facility, and Nowon and Yangchon's operation rate is as low as 29 and 61.2 %, respectively. As for material type of waste treated by the two incinerator plants, as presented in Figure 16, food waste accounts for nearly half of the total amount at both plants. Since food waste contains a lot of water to reduce heat efficiency of incineration waste, reduction and utilization of food waste are urgent policy issue. Paper also occupies large portion, 26% for Nowon and 22% for Yangchon. Also, 4 to 6% of waste treated in the plants is unfit for incineration, such as plastics, rubber, metal, etc

Energy Recovery From Landfill Gas - Seoul

Nanjido landfill had received almost all of unprocessed mixed municipal wastes generated in Seoul for 15 years from 1978 to 1993, with no prevention facility of environmental pollution. When it was closed in 1993, it became a huge garbage mountain with 94meter height and 92,000,000 m³ of mixed garbage. Most serious problem was groundwater contamination and methane gas emissions from the facility

According to a US EPA study, landfill methane gas emissions are a major contributor to greenhouse gases and global warming.²² Some scientific evidence says that methane gas has 20 to 30 times more negative impact than CO₂ on global warming. Therefore, how to treat methane gas buried in landfills is a big challenge to be solved.

The Seoul city government did stabilization project of the closed facility for 3 years from December 1996 to September 2001 to prevent groundwater pollution and methane gas emissions. Upon the stabilization project, the city\ government recently announced "the Nanjido landfill gas-to-energy plan." The followings are the summary of Nanjido landfill and the landfill gas-to-energy plan.

SWM in Some Asian Cities

Table:7
Typical characteristics of municipal solid waste management
in Asian cities by level of development

MSW characteristics	Level of development			
	Less-developed cities (Less than 2,000)	Rapidly developing cities (2,000-15,000)	Developed cities (16,000-30,000)	
MSW generation (kg/capita-day)	0.3-0.7	0.5-1.5		>1.0
MSW collection rate	<70%	80-95%		95-100%
Recycling	Informal	Formal and informal		Formal
Expenditure from municipal budget (%)	15-40	5-25		1-5

Source: Imura et al., 2005

Table: 8 Solid waste disposal characteristics by city in the countries of Southeast Asia

Country/City	Percentage solid waste disposal					
	Incinerated	Sanitary landfill	Open dumping	Recycle	Open burning	Other
1. Thailand						
Bangkok	-	99.0	-	-	-	1.0
Chiang Mai	2	98.0	-	-	-	-
2. Cambodia						
Phnom Penh	-	-	74.0	15.0	5.0	6.0
3. Indonesia						
Bandung	-	78.6	-	-	16.3	5.1
Jakarta	-	77.7	-	-	-	22.3
Semarang	-	74.3	-	-	-	25.7
Surabaya	-	70.0	-	30.0	-	-
4. Laos						
	-	-	-	-	-	-

5. Malaysia						
Penang	10	-	80.0	10.0	-	-
6. Philippines						
Cebu	-	100	-	-	-	-
7. Vietnam						
Hanoi	-	65.0	-	15.0	-	20.0
8. Singapore	66.3	33.7	-	-	-	-
9. China	-	-	-	-	-	-

Source: UNCHS, 2003

Among the ASEAN countries there is a marked range of waste generation per capita. Malaysia (population of 22 million) generated an estimated 5,475,000 tons of solid waste. This is about 0.68 kg per capita/day in 2001. This was comparable to Singapore's 5,035,415 tons of waste in the same year. However, Singapore's per capita waste generation is much bigger though it has a population of only 4,452,700.

Vietnam generates about 49,134,000 tons per year (about 0.61 kg/capita/day). In the Philippines, waste generation is an average of 36,172.50 tons per year, i.e. 0.50 kg/capita/day (in urban areas) and 0.30 kg/capita/day (in rural areas). In Lao PDR average urban waste production is 0.75 kg per capita per day. The quantity of waste produced by Thailand in 2001 was 14.1 million tons or 38,640 tons per day (about 0.23 kg/capita/day), an increase of about 470 tons per day compared to year 2000.

Mandalay City in Myanmar generates 10,526 tons per year, consisting mostly of 47.02 percent organic, 39.44 percent mixed in organics, 10.14 percent wood/trimmings, and 1.9 percent plastic. Vietnam's urban waste typically consists of 30 percent organics, 30 percent plastic, 15 percent paper, 25 percent glass, cans and other metals.

Phnom Penh, Cambodia, with a population of one million had a waste volume of 450,963 m³ in 1998 (1.23 liters/capita/day).

Brunei with a population of 340,800 (2002 estimate) generates waste at a rate of 392 tons a day (1.15kg/capita/day) comprising of 33 percent paper, 25 percent food waste, 16 percent plastic, 14 percent metals, 5 percent glass and 7 percent others.

In most ASEAN countries, there is generally no system to identify and classify MSW into domestic, commercial and/or industrial wastes. All types of solid waste are mixed together and not sorted at home or at other sources. So there is no differentiation during collection by public or private

contractors. In some countries waste collected is taken to a common processing center for separation, treatment and disposal.

An excellent example of SWM and waste as resource

NANJIDO.

Nanjido, a small islet in the northwest part of Seoul, was made a landfill in answer to the waste disposal problem that arose, due to the rapid development of Seoul into a metropolitan city, in the late 1970s. Before the World Cup Park was created, Nanjido was known as a home for mountainous piles of waste and garbage

*“Seen from a ferryboat,
Nanjido was embroidered with orchid flowers and a field of reeds,
Wearing a blue belt of clear rivulets.
A little rustic, like a pretty country woman.”*
From *Nanjido* by Jeong Yoenhee ,a student of Ph.d program in Austrlia

Nanjido became the site of a massive landfill dump covering 2.7 million sq.m. From 1978 to 1993, 92 million cubic meter of garbage including household, construction and industrial wastes were dumped (Seoul Metropolitan Government ,2002). There was no waste separation. Contaminants from households, construction, industry and sewage were co-mingled.

The landfill created massive environmental and social problems through air and water pollution and land subsidence. Over 15 years, the ignition of 2000 fires further exacerbated air quality problems (Seoul Metropolitan Government 2002).

The Seoul City Council closed the landfill in 1993 and covered the waste with a one meter soil capping to block odors. The Council then formulated a long-term plan to restore the degraded land into an environmentally friendly park. Commencing in 1994 and proceeding through to 2001, the landfill site was treated in four major phases:

- leachate treatment
- levelling and soil recovery
- extraction and recycling of landfill gas

A vertical leachate barrier was installed to a depth of 30m and extending 6km around the entire landfill mass. Leachate is collected at 31 wells placed at 200-m intervals around the perimeter and piped to a leachate treatment plant. Each day, 2.1ML of leachate proceeds through on-site primary treatment, secondary treatment at the nearby Nanji sewage treatment plant, and then is released into the Hangang River (Seoul Metropolitan Government 2002).

Landfill gas (LFG) is collected from over 100 gas extraction wells and piped to a LFG utilisation plant. Methane is generated at a rate of nearly 170cu.m/min and recycled for heating and cooling at the World Cup Stadium and nearby residential complexes. Slope stabilisation around the landfill (Seoul Metropolitan Government 2002). After 15 years buried under a giant municipal landfill waste dump Nanjido, The Isle of Orchids, has been recreated as World Cup Park. At 350ha, it is almost as large as New York's Central Park. It features a diverse array of commercial, recreational and sporting facilities and industrial precincts.

Management of SW in Bangladesh

Bangladesh, being a developing country, is predominantly a rural country. In 1951, the percentage of urban population was only 4.33% of the total population. Since then the rising trend has continued reaching around 24% by the year 2001. Total number of urban areas in Bangladesh is 514, which includes 6 City Corporations, 298 Pourashavas (Municipalities) and 210 other urban centers.(Huda,2008).

3 (three) 'systems' of waste management are coexisting side by side in Bangladesh. One is the '**Formal System**', where municipalities/city corporations are responsible for Solid Waste Management (SWM). 'Formal system' is based on the conventional system of collection transportation- disposal of waste carried out by the local authorities. In this system the concept of transfer stations, resource recovery, minimization and recycling are absent. Next is the '**Community Initiative**' that is based on primary solid waste collection by CBOs and NGOs, 'Community Initiatives' of house-to-house waste collection in neighborhood started due to lack of satisfaction with solid waste management service. Finally, '**Informal System**' represented by the large informal labor force involved in the solid waste recycling trade chain.

In Bangladesh, NGOs like Waste Concern, *Prodipan*, Environmental and Geographic Information Systems (EGIS) are coming up with strategies to manage the solid waste specially in primary collection.. *Prodipan* is working from collection of solid waste to composting and runs a small scale incineration plant.

The following table shows the growth in solid waste generation over the years.**Table No:9**

Total Urban Solid Waste Generation in Bangladesh

Year	Total Urban Population	Urban Population (% Total)	Waste Generation Rate (kg/cap/day)	Total Waste Generation (Tonne/day)
1991	20872204	20.15	0.49**	9873.5
2001	28808477	23.39	0.5***	11,695
2004	32765152	25.08	0.5***	16,382
2025	78440000	40.0	0.6 **	47,064

** Source: ADB, 2000, Zurbrugg 2002,

It is evident from the above Table that solid waste generation in urban areas in Bangladesh is growing with the growth of population as well as per capita GNP. In 1991 the per capita GNP was US \$ 213 (World Bank, 1997) while the GNP in 2001 was US \$ 351 per capita and in 2003 it was US \$ 370 (Zurbrugg, 2002).

Table:10
Total Waste management in urban areas of Bangladesh

City/town	TWG ton/day	Waste collection rate%	No. of cleaners /1000 pop	Cost per ton,tk.	% of recycling
DCC	4634.52	37	1.2	669.98	15.00
CCC	1548.09	70	0.77	411.59	12.45
RCC	172.83	56.67	0.8	235.56	6.7
KCC	321.26	47.70	0.62	986.00	6.00
BCC	134.38	44.30	1.24	1932.00	5.42
SCC	142.76	76.47	0.85	1562.00	4.23
PS	4678.40	54.42	1.05	447.85	3.89
OTHERURBAN CENTERS	1700.65	52	0.05	312.00	4.00
TOTAL	13332.89	Average 55%	-	-	-

(Source: Self Compiled, Waste Concern Technical Documentation, 2005)

It is evident from the above Table that waste collection rate is the lowest among six city corporations though the number of cleaners/1000 is not so less. Waste generation rate per day is the second highest which is a burning question now a days.

Solid Waste Management Related legislations in Bangladesh

National Level Framework: No seperate policy in Bangladesh regarding SWM SW handling Rules
CDM Strategy 2004 identified SW as potential sector Urban SWM Management policy statement: only mentions SW but no specific direction
National Environmental Management Action Plan: No specific guideline.

- ☐ Local Level Framework:
- ☐ No adequate legislation
- ☐ SWM is entrusted with Local Government Bodies

Environmental Conservation Act 1995, Environmental Conservation Rules,1997 National Policy for Water supply and sanitation No specific direction about SWM in above three legislations
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Conclusion: The following chapter will try to focus broadly on SWM in Dhaka City. It will bring to light concern authority for managing waste of DCC and basic laws to discharge responsibility. It will broadly describe how waste is managed and existing functions, institutional capacity of Conservancy Department of DCC which is responsible authority regarding it.Finally how medical waste is managed and relate PPP with it will be presented

Chapter – 4

Solid Waste Management in Dhaka city

Introduction

This chapter gives emphasis on SWM issues in local level that means focus is given in micro level. It broadly describes responsibilities and existing institutional capacities of DCC. How waste is collected, transported and disposed are also presented including conventional methods of solid waste disposal. Solid waste is a public good and government is responsible for managing it, but now a days it is also managed privately in Dhaka City. Therefore chapter responses to private waste management and relate it with PPP. Some models of PPP relate with SWM is also discussed. It also focuses on prevailing actors and factors relating to SWM

Dhaka (formerly **Dacca** and **Jahangir Nagar**), is the capital of Bangladesh. Dhaka is a megacity and one of the major cities of South Asia. Located on the banks of the Buriganga River, Dhaka, along with its metropolitan area, has a population of over 12 million, making it the largest city in Bangladesh. It is also one of the most densely populated cities in the world. Dhaka is known as the *City of Mosques* and renowned for producing the world's finest muslin. As a cosmopolitan city, Dhaka has been the center of Persio-Arabic and Western cultural influences in eastern Indian Subcontinent Under Mughal rule in the 17th century, the city was known as Jahangir Nagar. It was a provincial capital and a centre of the worldwide muslin trade. The modern city, however, was developed chiefly under British rule in the 19th century, and became the second-largest city in Bengal after Calcutta (presently Kolkata). After the Partition of Bengal in 1905, Dhaka became the capital of the new province of Eastern Bengal and Assam but lost its status as a provincial capital again after the partition was annulled in 1911. After the partition of India in 1947, Dhaka became the administrative capital of East Pakistan, and later, in 1972, the capital of an independent Bangladesh. It consists of seven principal thanas – Dhanmondi, Kotwali, Motijheel, Paltan, Ramna, Mohammadpur, Sutrapur, Tejgaon – and 16 auxiliary thanas – Gulshan, Lalbagh, Mirpur, Pallabi, Shah Ali, Turaag, Sabujbagh, Dhaka Cantonment, Demra, Hazaribagh, Shyampur, Badda, Kafrul, Kamrangir char, Khilgaon and Uttara. In total the city has 130 wards.

Although its urban infrastructure is the most developed in the country, Dhaka suffers from urban problems such as pollution, congestion, and lack of adequate services due to the rising population. Dhaka is consistently ranked as one of the least livable cities in the world.

Dhaka City Corporation : DCC is the formal organization for SWM in Dhaka city.

Dhaka City corporation was established as the Dacca Municipality on August 1,1864. The first elected Chairman was Annanda Chandra Roy. Mayor and Commissioner are elected through popular vote. It was renamed in 1978 as Dhaka Municipal Corporation and again in 1990 as Dhaka City Corporation. Until 1994,Mayors were appointed by the Government . First elected Mayor was Md. Hanif and present Mayor is Sadak Hossain Koka. DCC was previously administered through the Dhaka city corporation Ordinance , 1983 , The Dhaka city corporation (Amendment) ordinance,1991. Currently the former laws were repealed by Local Government (City Corporation) Ordinance, 2008.The number of ward is ninety and is divided in to ten zones.

Functions of Dhaka city corporation (in brief)

Table No:11

<u>Animals</u> Animals husbandry Stray animals Animal hones and farms Registration of sale of cattle Livestock improvement Dangerous animals Cattle show, zoo Disposal of carcasses etc.	Food and Drinks , culture: Library Fairs and shows public health Sanitation Removal and disposal of refuse public safety, Public streets Streets General provision about streets Encroachment Streets lighting Streets watering
Development Development plans Community development project Health development project Slum development	
Civil defense	

<p>Floods</p> <p>Famine</p> <p>Dangerous and offensive articles</p> <p>Burial and burning places</p> <p>Latrines and urinals</p> <p>Birth, death and marriage registration</p> <p>Infectious diseases</p> <p>Health and maternity centers</p> <p>Public health</p> <p>Hospital and dispensaries,</p> <p>Medical aid and relief</p> <p>Social welfare,</p> <p>urban planning,</p> <p>Master plan</p> <p>Site development schemes</p> <p>Execution of site development scheme.</p>	<p>Traffic control, Public vehicles</p> <p>water supply and drainage</p> <p>Arboriculture</p> <p>Gardens</p> <p>Open Spaces</p> <p>Forests</p> <p>Nuisances pertaining to tree</p> <p>Tank and low-lying areas.</p> <p>Water Supply</p> <p>Private sources of water supply</p> <p>Drainage schemes</p> <p>Bathing and washing places</p> <p>Dhobi ghats & washer men</p> <p>Public water courses</p> <p>Public ferries</p> <p>Public fisheries</p>
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Manpower by category

Table No.12

Category	Approved	Existing	Vacant
1st Class	346	271	75
2nd Class	178	127	51
3rd Class	2298	1735	563
4th Class	2230	1836	394
Total :	5052	3969	1083
Master Roll :	7156	7156	0
Grand Total:	12208	11125	1083

Source: www.dcc.org

Basic laws regarding Solid Waste Management in DCC

Dhaka City Corporation Ordinance is the basic law regarding street/drain cleaning, waste collection and transportation. According to Section 78 of the Ordinance, DCC is allowed to provide dustbins or other receptacles at suitable places, and to require residents to bring their waste to the dustbins or receptacles. However, it is not clearly mentioned who takes responsibility of primary waste collection where such dustbins or receptacles are not provided.

Management of solid waste by DCC

Conservancy Department

Conservancy Dept. is the core organization for solid waste management and is in charge of street and drain cleaning, carrying street and drain waste to dustbins/containers, and loading and unloading of waste to and from truck at places of dustbins/containers and disposal sites. Conservancy Department comprises a predominant portion of field workers and very few officers for planning and administration at headquarters.

Functions of Conservancy Department

- Collect solid waste from domestic, business, hospital, street, public toilets and drains..
- Provide dustbins and other receptacles for accumulating the waste.
- Supervise cleaners who clean the roads, drains and sewerage lines.
- Collection and transportation of medical waste.
- Development of hospital waste landfill
- Arrange community meeting for promoting community base solid waste management
- Development of sanitary landfill

Work with JICA for clean city Dhaka in 2015.

Manage the private solid waste management and NGO based solid waste management

Source: www.dcc.org.

Institutional capacity of Conservancy Department

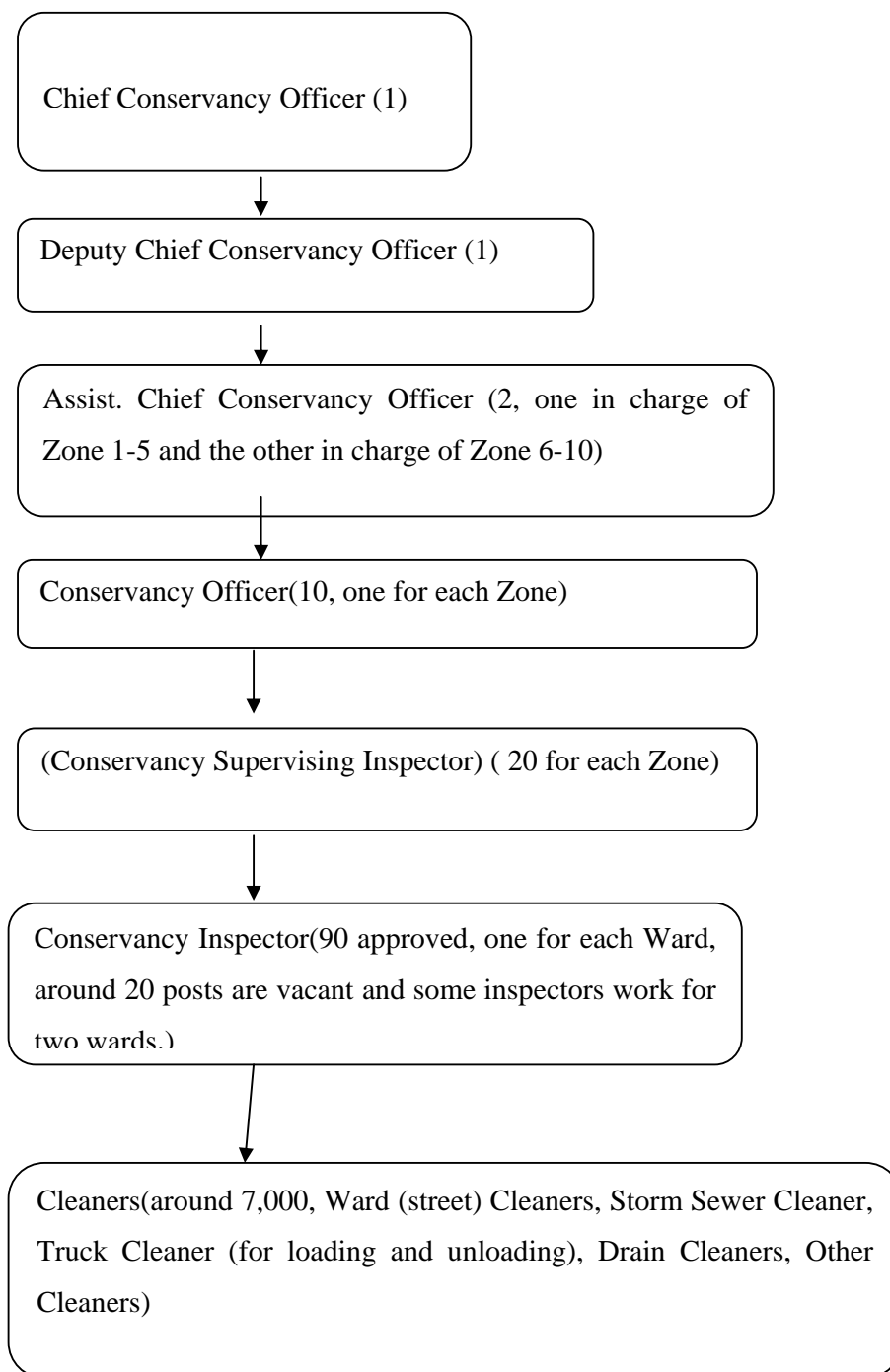
Total cleaners	7500
Total trucks	370 (cover + open)
Handtrolley	2080
Total staff	Conservancy – 600, supervisory - 135
Annual budget(2002/2003)	476 million taka, tax revenue 146 million taka, budget deficit 330 million taka
Source of income	2 percent conservancy tax of total property value

Negative correlation between income and expenditure. DCC spent 15.42 percent taka on SWM of total income, where in Mumbai 303 taka, Manila 192 taka

Source: State of Dhaka Environment Report, 2005

Figure: 6

Workforce of conservancy Department



Source: interview of DCC officials

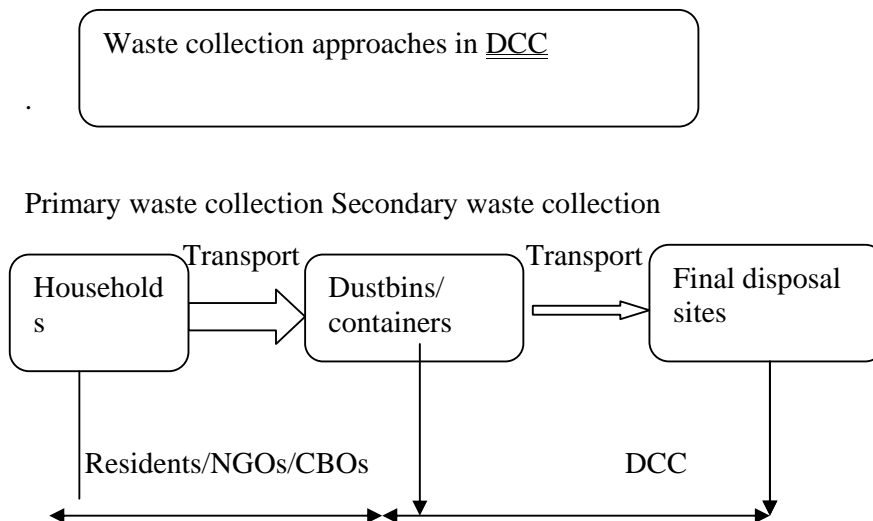
Waste Management of DCC is accomplished in following 4 phases :

- Primary Collection & Accumulation
- Transportation
- Final Disposal

According to DCC Ordinance of 1983, DCC has the responsibility for secondary collection as well as proper disposal of waste. From Zone 1 to Zone 4, all of garbage is transported to Matuail landfill site while Zone 5 to Zone 9 use both Matuail and Berri Band landfill site (Gabtoli). Waste from Zone 10 is dumped at Uttara landfill site.

Primary Collection

FIGURE NO.7



In Dhaka City, waste collection consists of two parts, namely primary collection and secondary collection. DCC is responsible for secondary waste collection to remove waste from its dustbins/containers, and transport the waste to final disposal sites.

Residents are responsible for bringing their waste to DCC's waste collection points where dustbins/containers are located. NGOs/CBOs/private sector provide primary collection services and collect waste door-to-door and transport the waste to dustbins/containers, or sometimes to vacant lands, by rickshaw vans. Primary collection is a labor-intensive work that uses rickshaw vans usually manned with one van driver and one to two helpers. They go to each house, collect waste from residents and put the waste into the rickshaw van. In some areas, residents bring their waste to rickshaw vans using buckets/bags by themselves. After collecting waste from house-to-house, the rickshaw drivers and helpers dispose of the waste in DCC dustbins/containers, or at vacant lands.

Various local civil societies or CBOs duplicated the system of door-to-door collection introduced in Kalabagan in 1987. It is said that more than 130 organizations were providing the door-to-door waste collection services since 1999. (JICA, 2005)

Approval of NGOs/CBOs for Primary Collection by DCC

In 2002, DCC introduced an approval system of NGOs/CBOs/private organization for providing door-to-door waste collection services ward-wide. At present, Chief Conservancy Officer has authority to sign the approvals. Organizations submit proposals and DCC evaluates those proposals and approves them. At present, DCC has given approvals to 47 NGOs/CBOs to work in 57 areas, covering 52 Wards (JICA, 2005). These CBOs playing significant role in the primary collection of the Solid Wastes.

Nearly 7500 Nos. of DCC sweepers/cleaners sweep roads and clean drains and then put those wastes into the nearby dustbins or containers using a Hand Cart. Dhaka City Corporation has 3 different types of dustbins. Such as: (i) Brick/Cement Made, (ii) GI Sheet Built & (iii) Auto-lifting Container

Transportation

The wastes are transported by fleet of open (flat bedded) or closed vehicles (with vertically sliding shutter on both sides) from the old part of the city where the roads and the lanes are narrow. In the new part, de-mountable container system (hydraulically operated) is working. Every vehicle has got specified areas and route through which they move to collect wastes. 370 Nos. of trucks (Both open & covered) and container carriers are engaged in transporting the Solid Wastes from the dustbins/containers to the disposal sites. For loading they use cane basket & "Belcha" (Shoval)

Table No.13

Allocated Number of collection/Transport vehicles

Type	Number of vehicle
Open truck	213
Container carrier	127
Trailer truck	3
Total	343

Source: Interviewed of DCC officials

If we analyze the table we find that total number of vehicles is 243. Open truck is 213 and no covered truck is there.

Final Disposal

Method of Waste disposal in Dhaka City

1. Land filling
2. Open dumping
3. No composting
4. No recycling

Garbage Trucks & Carries bring the collected Solid Wastes to the selected Dumping Sites. DCC uses three

landfill sites (namely Matuail, Berri Band and Uttara, .It is said that Matuail is the only official landfill site owned by DCC. The site has surrounding embankment and solid waste is filled inside the embankment. On the otherhand, Berri Band and Uttara dumpsites are private land. It is explained that owners of the land requested that DCC fill the land with solid waste, and so DCC has been disposing solid waste there. The remaining capacity of Matuail site is estimated at 1.1 million ton as of the end of 2004.(JICA ,2005)

Table No.14

Existing landfill sites in Dhaka

Name of the site	Area(hector)	Start operation	Incoming truck
Matuail	20	1993	282
Berriband	4	Not clear	138
Uttara	1	2003	18

Source: JICA 05:45

Table No.15

Average incoming waste amount to disposal site

Survey time	Matuail		Berry band		Uttara		Total	
	Waste amount carried (t/d)	Number of vehicles (unit/d)	Waste amount carried (t/d)	Number of vehicles (unit/d)	Waste amount carried (t/d)	Number of vehicles (unit/d)	Waste amount carried (t/d)	Number of vehicles (unit/d)
Dry season	649	226	313	122	06	2	969	350
Wet season	913	338	399	153	104	33	1416	525
average	781	282	356	138	55	18	1193	437
	65%	65%	30%	32%	5%	4%	100%	100%

Source: JICA 05 :98

If we analyze the table we find that Matuail absorbs thirty five percent of total waste volume while Berry band and Uttara absorb respectively 30% and 5%.

Recycling

Dhaka City Corporation yet to have any Solid Waste re-cycling project. However, waste which have market value are being reclaimed or salvaged by waste pickers for recycling.

Private Solid Waste Management

Private Solid Waste Management in Dhaka City is a new approach. Recently Dhaka City Corporation fully privatizes its conservancy works in Uttara, Gullshan , Banani, Baridara, Mohakali and Tejgaon areas. These areas cover the northern part of the city , zone 9 &10 (No.1,17,18,19,20,21,37,and 38.). The private parties are handling this works very smoothly. Two NGOs and two private contractors are responsible to run the project properly.

:Table-16

Composition of Solid Waste

Source category	Income level	Composition(%)					
		paper	Food waste	Wood& grass	plastics	Sand& dust	others
Domestic waste by income group	Upper	12	49	21	2	1	15
	Middle	6	80	0	1	1	13
	Lower	4	71	1	2	17	5
	average	7	66	7	2	6	11
Business waste	Restaurant	2	97	0	0	0	1
	Shop,hotel	4	89	1	1	0	5
	Market	5	53	23	3	6	9
	Public office	35	19	25	0	14	7

Street waste		2	4	10	0	73	11
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Source : Interview of DCC officials

If we analyze the above table we find that average sixty six percent waste is organic (food) and plastic is two percent and the highest is three percent which is used in market.

Table: 17

Department and operation wise actual SWM cost

Department wise:Table:16(a)

<u>Items</u>	1999-00 (million taka)	200- 01(million taka)	2001- 02(million taka)	2002- 2003(million taka)	Ratio(million taka
Conservancy department	212	243	279	305	64
Transport department	66	73	84	106	22
Engineering department	89	67	39	65	141
Total	367	383	402	467	

Source: JICA, 2005

If we analyze the table we find that cost of conservancy department is increasing from 1999 to 2003, on the other hand cost of engineering department is comparatively reducing.

Table no.18

Operation wise:

Items	1990-00 (million taka)	2000-01(million taka)	2001-2002 (million taka)	2002-2003 (million taka)	Ratio (million taka)
Cleaning of roads and drains	201	227	249	273	57
Collection and transport	87	98	116	139	29
Final disposal	05	5	6	7	1.4
Repair works	74	53	31	57	12
Total	367	383	402	476	

Source: JICA 05:45

If we analyze the table we find that operation cost of SWM is upward trend and the highest expenditure(273million taka) is in cleaning roads and drains, on the other hand city authority spends only seven million taka in final disposal while collection and transport cost is moderate.

Table No: 19**Financial balance of SWM**

Items	1999-2000(million taka)	00-01(million taka)	01-02(million taka)	02-03(million taka)	Ratio inDCC own account(percentage)
Overall SWM revenue	126	141	150	176	6%
Overall SWM expenditure	367	383	402	476	8%
Balance	-241	-242	-252	-300	

Source: Waste Management Division, DCC

If we analyze the table we find that the financial balance of SWM is unsatisfactory as subsidy has to allocate as it is not earning enough revenue. The overall revenue was 176 million taka and expenditure was 476 million taka that means negative balance and this trend is upward.

Table No.20

Total waste generation:

Types of waste	Waste volume
Domestic	1950 t/d
Business	1050 t/d
Street waste	200 t/d
Medical waste	300t/d

Source: Interviewed of DCC officials

If we analyze the table we find that domestic waste is the highest (1950 tons per day) and business waste is the second highest.

Table No.21

Zone wise waste generation:

zone	Domestic waste	Business waste	Street waste	Total	Collection Rate
1	240	90	40	347	30%
2	160	170	40	356	44%
3	170	45	33	228	33%
4	290	90	40	403	31%
5	170	80	40	277	71%
6	170	130	40	325	54%
7	250	130	40	401	35%
8	280	160	40	458	19%
9	200	145	40	363	31%
10	20	18	05	43	42%

Source: JICA 05:67

If we analyze the table we find that DCC is divided in to ten zones and zone 5 has the highest collection rate(71%) and the lowest is in zone 8(19%).The main reason for highest collection rate is as many CBOs and NGOs are working there for primary collection.

Table No.22

Assignment and number of cleaners and drivers

Workers category	Assignment area	number	Total number	Age
DCC worker			6,992 (6.880 cleaners are deployed to Zones and Wards	15~24=15%, 24~44=61%, 45~54=20%, >55=4%. Over 64 years = 1.43% (about 100 cleaners). There is no retirement system for Cleaners, so they could spend all their life doing this kind of work. There are many old cleaners in the Road Cleaner group. Comparatively Truck Cleaner and Container Cleaner are younger than Road Cleaner.
Road cleaners	ward	5003		
Deep drain cleaners	zone	284		
Storm sewage cleaners	zone	119		
VIP road cleaners	Zone	178		
Market cleaners	Zone	425		
Other cleaners	Zone	19		
Truck cleaners	Zone	663		
Special truck cleaners	Zone	189		
Container cleaners	central	112		
Truck driver	ward	266	Most of them (76%) are between 25-44 years old	
Container driver	Central			
Private worker	Zone 9 & 10		578	
Road cleaner		359		
Deep drain		86		

cleaners				
Truck cleaners		106		
Truck driver		27		

Source: Conservancy Officers of Zone Office,

If we analyze the table we find that total number of cleaners in eight zones is 6880, on the other hand this number is only 578 in two zones. The average number of cleaners for each zone is 860 (for 8 zones) while this number is only 289 (for zone 9 & 10). The reason behind is the latter zones have been privatized and the former zones are not.

Table No. 23

Deployment of cleaners by zone

Symbol→	A	B	C	D	E	F	G	H	I
ZONE no	Road cleaner	Truck cleaner	Draincc leaner	Storm sewer cleaner	VIP road cleaner	Market cleaner	Special truck cleaner	Other cleaner	total
10	65	27	24	0	0	0	0	0	116
9	294	79	62	0	0	0	0	0	445
8	465	33	40	0	20	15	20	0	593
7	460	33	40	0	20	7	19	9	588
6	586	141	25	39	36	132	18	0	977
5	633	121	48	13	50	97	40	10	1012
4	832	129	44	17	40	49	18	0	1129
3	565	71	32	12	4	15	8	0	707
2	681	65	25	25	0	78	8	0	882
1	781	70	30	13	8	32	58	0	992
DCC cleaner (zone 1-8)	5003	663	284	119	178	425	189	19	6880
Grand total	5362	769	370	119	178	425	189	19	7441

Source: JICA,05

If we analyze the table we find that total road cleaners in zone 1-8 is 5003 while this number is (zone 9 &10) 315. The average is(zone 1-8) is 625 while it is only 157 (zone 1-8).The number of other cleaners is also more in zones where primary collection is not privatized.

Table No. 24.

Service charge for door to door collection (per month – taka)

Income	Area	Service charge(per month – taka)
High	Gulshan ,Banani (ward-19)	Hotel (500-1000) Resident -rich(100-300)
Middle and low	Khilgoan(ward-23)	Resident – middle-30 Low -10
Middle and low	Mirpur (ward-6)	Resident – middle 40 Low- 20 Industry – (100-500)

Source: interviewed of households

If we analyze the table we find that the households are willing to pay service charge and the positive sign is that low income people is also willing to pay. Middle income people are playing important roles as they are more aware and are forming CBOs in their respective area.

Medical waste management

Medical waste is considered as the worst form of hazardous waste, which requires specialized treatment and proper management for safe disposal. According to Dhaka City Corporation's (DCC) Solid Waste Management Division, the volume of total solid waste generated in the city is around 3,500 metric tons a day of which around 50 metric tons are from healthcare facilities. There are various types of medical waste.

1.GeneralWaste

- 2.Liquide Waste
- 3.Infectious Waste
- 4.Plastic Waste
5. Sharp Waste

Table No: 25

.Average medical waste generation volume :

Types of waste	Amount (percentage)
General waste (kitchen waste,medicine box)	77.45
Infectious waste(cotton, bandage,amputated body parts, placenta,blood of urine bags)	14.08
Plastic waste(syringe without needle,saline bags,gloves)	3.83
Liquid waste(blood,laborotary chemicals)	3.4
Sharp waste(needle,blade,knife,vial ampoule)	1.24

Source: JICA ,2005

There is no updated information about the existing healthcare facilities. According to the health ministry, there are only 368 registered clinics in the capital and 845 outside Dhaka. The number of diagnostic centres is 1,541 of which 580 are in Dhaka city.

However, the number is far more than that as many hospitals continue to run without registration, sources at the Directorate General of Health Services (DGHS) said.

Hospital wastes that are segregated at sources, more or less, are normally discharged to a public dustbin in which wastes are mixed with general municipal waste. The wastes discharged and stored in the dustbin are eventually scavenged by a waste pickers to recover recyclables. Remaining wastes are collected by DCC waste collection fleet for a final disposal, mostly land disposal, at official or unofficial dumpsites.

According to Dr. TariqBin Yousuf ,Project Director (Matuail Landfill) Dhaka City Corporation, Medical waste volumes are as follows:

Table:26

Health care waste and its generation:

Forms of medical waste	volume
Infectious, Harmful, Toxic & hazardous	10%-30%
General waste	70% - 90%
waste generation rate	1.9 kg/bed/day
Hazardous(Average)	0.169 kg/bed/day

Some good initiatives in HCW Management after 2005:

Recently Bangladesh government has introduced medical waste handling rules for all health care service centres which is mandatory for all hospitals, clinics and other health care establishments.

- In-house segregation and storage in colour-coded bins
- DCC allocated 0.4 hectare land for final management
- HCEspay service charges

According to this handling rules each and every hospital and clinic has to segregate own waste in the following ways:

1.General Waste (Black Bin) is put on the dcc bin,disposal by dcc

2.Liquid Waste (Blue Bin)discharged in to the drain and managed by biological system by the respective health care establishments.

- 3.Infections Waste (Yellow Bin)**
- 4.Pl astic Waste (Green Bin)**
- 5.Sharp Waste (Red Bin)**

Above the three collected by PRISM Bangladesh in three Separate color bin. Finally infectious waste is disposed through autoclaving, burial and incineration.

New Approach of Medical Waste Management(PPP) in BANGLADESH

PRISM (Project in Agriculture, Rural Industry, Science and Medicine) Bangladesh, a reputed national NGO in Bangladesh, is now working for medical waste management in association with the DCC. With financial and technical support from Water and Sanitation Programme (WSP),PRISM Bangladesh carried out a survey on the medical waste management in Dhaka City. Subsequently, PRISM Bangladesh with the financial support from Canadian International Development Agency (CIDA) has recently developed a disposal facility for low cost medical waste treatment and management in Dhaka City.

The DCC has allocated one acre (0.405 hectare) of land in Matuail, a dumpsite near the city limit for the final disposal of medical waste. .In the new approach, PRISM Bangladesh is involved in training relevant personnel of different HCE for increasing awareness and proper in-house management of medical wastes.

Bangladesh has developed a system for collecting segregated hazardous wastes (except radioactive wastes)from each HCE through newly set up vehicles to carry this waste for final dumping at their newly developed Matuail Plant. It has introduced in-house storage of medical waste in colour-coded bins. All of the HCE should now be using the Government of Bangladesh (GoB) approved colour-coded high density polyethylene bags for easy identification and segregation of infectious and non-infectious medical wastes. This minimises the actual volume of potentially infectious medical waste and makes the disposal less costly and more effective.

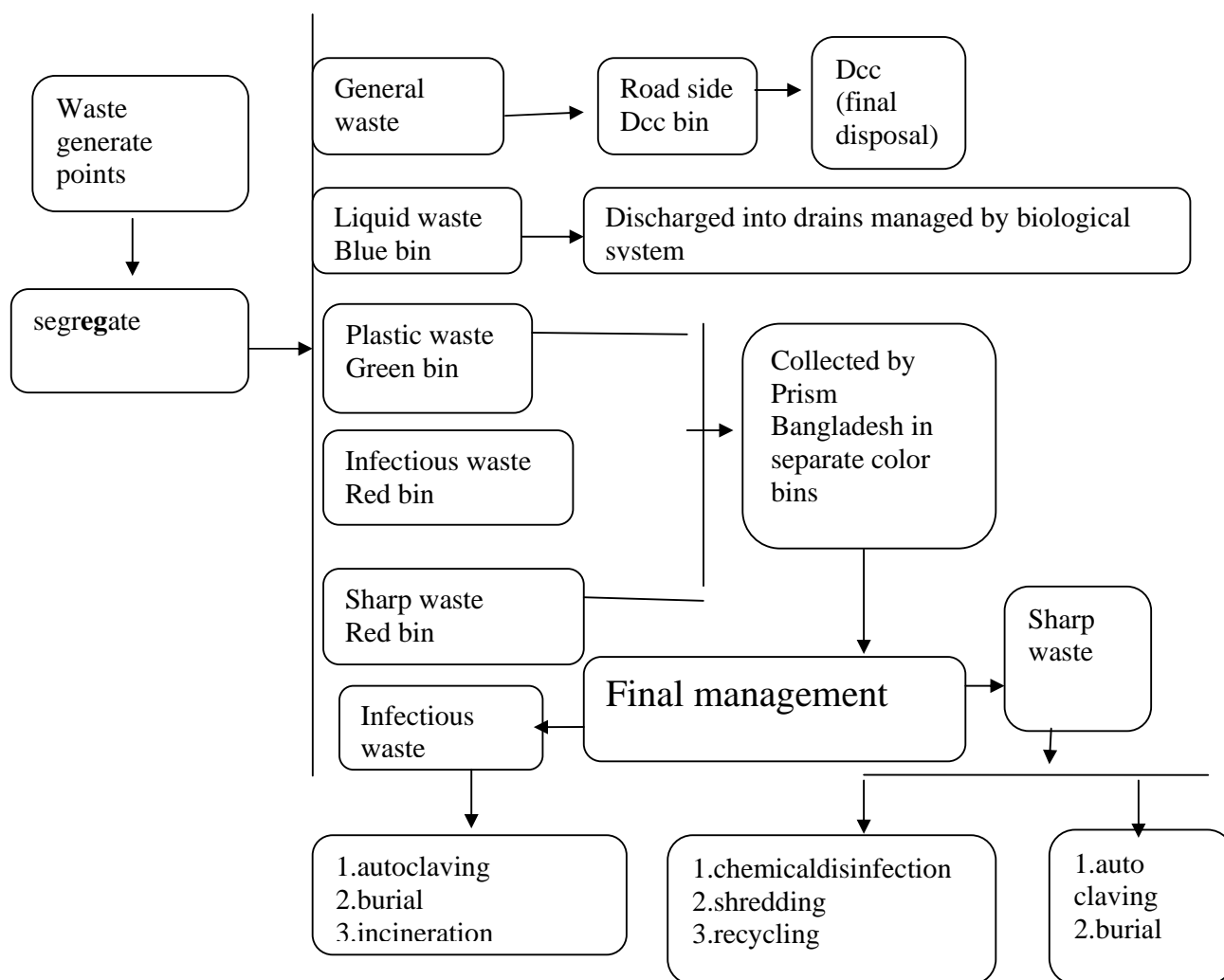
HCE in Dhaka City are paying a service charge for the collection from their premises and final management at the Matuail plant. Even govt. hospitals are not under the initiatives, but now these hospitals have a fund subsidies by govt. a management committee is there to supervise the works.

To protect resale and reuse of syringes, both manual and electric needle destroyers have recently been introduced to different HCE to cut needles from syringes to protect against HIV and Hepatitis viruses. A small effluent treatment plant has recently been constructed to treat the waste water generated in the plant. One heavy duty autoclaving machine has recently been installed for sterilizing cotton, gauge, bandage and such other contaminated materials. These sterilized materials are mixed up with the general civic waste for disposing in DCC dumping area. An incinerator donated recently by a Japanese organisation is installed at the Matuail plant. The use of an incinerator treats a large amount of waste as well as reduces the volume of waste considerably (<http://www.biomedcentral.com>)

Recent developments

Government hospitals are entering into the system. Rules for medical waste management have been introduced drafted. Decision has been made to introduce medical waste management course in Medical Education Curriculum.

Figure: 8 At a glance PPP in medical waste management:



Ward-Wise Waste Management Project (PPP initiative)

Objectives

To provide superior quality of service to the residents

Project Area 8 Wards

Zone 9: Ward 17, 18, 19, 20, 21, 37, and 38

Zone 10: Ward 1

Responsibility of private Parties

1. clean all roads, market, park, footpaths, etc
2. clean all open and closed drains.
3. clean the surrounding area of dustbin and container
4. Dump the waste at landfill site (Matuail)

Roles of DCC:

1. conservancy supervising inspectors and conservancy inspectors of Zone 9 and Zone 10 of DCC gave practical training to the cleaners.
1. 2. DCC gave practical training to the contractors.
2. 3. Monitor their activities
3. 4. Send performance report

Source: Urban Planning Dept., DCC

Area based solid waste management in Dhaka (PPP)

To encourage area based is the main objective of DCC and JICA Study Team according Clean Dhaka City Master Plan . This initiative has been launched based on the growing demands of city dwellers in each and every ward so that waste can be managed socially and economically accepted way through their active participation and empower them. According to DCC rules, it is the responsibility of waste generator to dump waste into the DCC bins/ containers..To achieve the objective DCC is working with a view to include all stakeholders in this purpose.

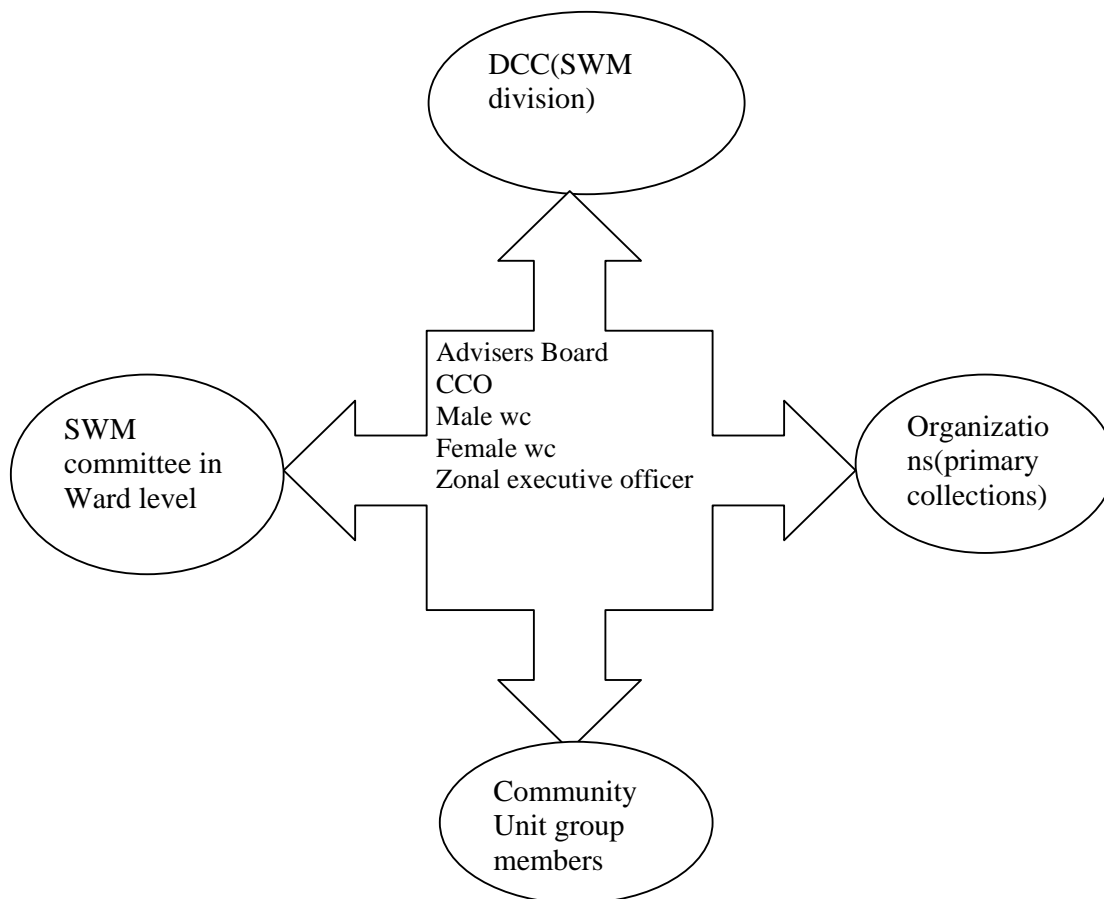
What is area based SWM?

Coordination between DCC and organizations involved in primary collection from door to door by the community people, local level planning and implementation of such plans by them in order to keep their respective area clean and environmentally sound, is called area based swm. It is a endogenous initiatives and main objective is to include all stakeholders involved in it. The main focus is at micro level and each ward is the focal point.

Objectives:

- 1 Area based planning and implementation by the community groups in each ward.
- 2.Effective coordination and enhance efficiency in quick transport of solid waste.
- 3.Ensure hundred percent collection. With a view to it,bring all small shops, slums and dense area of narrow roads under sw collection.
- 4.Increase civic engagement of citizen.

Figure: 9



Members of Community Unit Group:

1. Voluntary workers
2. Professional groups (religious leaders, teacher,)
3. Retired person

Why it needs?

1. To refrain from throwing waste around dcc bins/containers
2. To refrain from throwing waste in roads
3. To refrain from throwing waste in drain
4. Ensure house to house collection
5. Increase consciousness among citizens

Roles and responsibilities of partners in area based solid waste management:

Ward Solid Waste Management Committee:

1. evaluate primary collection service providers by having an interview with each of them. The evaluation criteria will cover the following:

- Financial capacity
- Management capacity
- Acceptability by community people
- Attitude of cooperating with community people
- Understandings of local conditions

2. Coordination and agreements would be made among Ward Solid Waste Management Committee, primary collection service providers and DCC

3. Organize regular meetings with primary collection service providers regarding the daily activities of primary collection. DCC Conservancy Inspector and staff of Community Solid Waste Management Section, and Community Coordinators of Zone offices should also participate in the meeting.

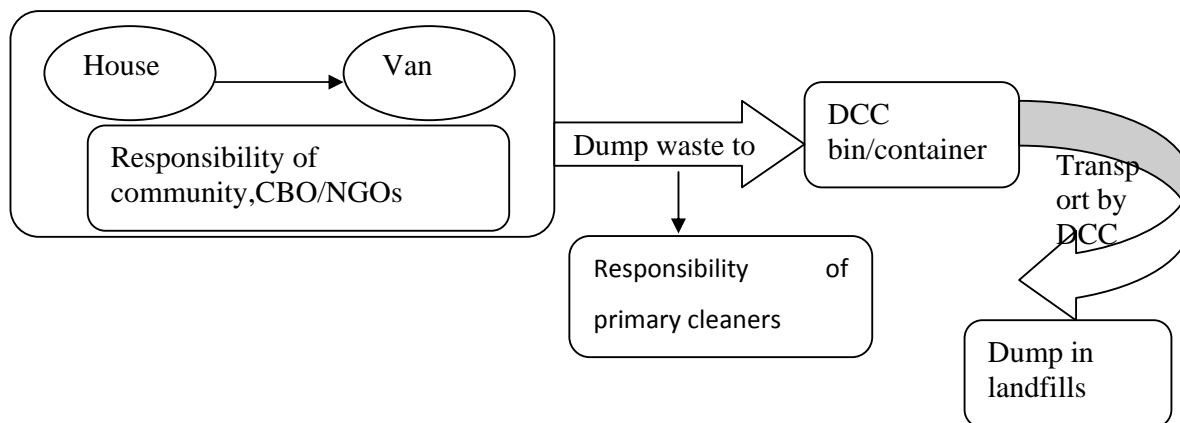
Community Unit Working Group

1. Supervise the activities at the community level by observing and getting the opinions of community people.
2. To increase public awareness in Dhaka City, the following should be implemented: There are various target groups for raising awareness of solid waste management such as aged and young persons, men and women, of different education and income levels.

Conservancy Department of DCC

1. Make efforts toward supporting primary collection service providers technically in order for them to improve their capacity and to provide proper and efficient primary collection services in Dhaka City.
2. Make continuous efforts to develop and improve the primary collection methods considering local conditions, in order to improve the efficiency of solid waste management
3. Examine and develop the methods of primary collection and linkage with secondary collection, in order to improve the efficiency of primary collection.
4. At present, transfer of waste from rickshaw vans to containers takes time and the waste scatters around containers. DCC would conduct pilot projects to introduce new design of rickshaw vans and containers
5. Organize annual conference inviting primary collection service providers to share their work experiences and problem-solving, and to discuss how to improve the primary collection technically
6. Solid waste matters cover Environmental subjects. Matters regarding solid waste should be taught by showing real situations and their relation with other daily activities. Most of school teachers are not competent to teach about solid waste, because they do not have proper knowledge of solid waste and have never visited solid waste management facilities

Figure: . At a glance ppp in ward wise solid waste management:



Scenerio after inception of PPP in SWM in Dhaka City

In 2005, DCC privatized conservancy works in zone 9 and 10. According to officials of DCC, due to privatization cost has been reduced drastically, though service quality is not improved as it was expected. According to JICA Study Team, for cleaning of roads/drains and public spaces, DCC deploys about 7,000 cleaners in eight zones while private firms deploy about 600 cleaners in two(9&10) zones. A remarkable feature of DCC cleaners is the working hours; they work on average 4 hours with minimum 2 hours while private cleaners work on average 6 hours with minimum 4 hours.

This study reveals that productivity of workers is increased under PPP. SWM cost is also reduced. According to Conservancy department ,the salaries of DCC cleaners is in average Tk.5000, on the other hand in private cleaners salary is Tk.1500- 2000. They working on temporary basis, while the most of the DCC cleaners are permanent and they get house allowance along with gross salary .The statement indicates drastic reduction of cost in swm.

Table No.27

Comperative Study regarding working hours of DCC and private cleaners

Working period(hours)	DCC cleaner(percentage)	Private cleaner (percentage)
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7-8	0.7%	25%
6-6.5	15%	46.9
5-5.5	9.3%	21.9
4-4.5	45.6%	6.2
3-3.5	22.9%	-
2-2.5	6.5%	-
Starting time of work		
At 4.00 a.m	32.8	
At 5.00 a.m.	50.7	
After 6.00 a.m.	16.5	
Average working hour	4.12	
Duration of working hour		
Maximum	8 hours (6 a. m. -14 p.m)	8 hours (6 a.m. -11a.m.&14 p.m.-17 p.m)
Minimum	2hours (7 a.m. -9 a.m)	4 hours (6 a.m. -10 a.m.)

Source: JICA 05:67

If we analyze the table we find that the productivity of DCC workers is far less than the private cleaners. 25% private workers work 7 to 8 hours while the percentage is less than one in DCC workers. About 45% DCC workers work 4 to 4.5 hours while this percentage is only 6 in private workers.

Table No.28

Comperative data of road cleaners and other cleaners

Road cleaners			Garment factory workers	
	DCC	Private	Machine operator	Assistant
Salary	Permanent workers – tk.4000, (who have working experience not less than 10 years Tk.5200/ who have working experience not less than 20 years Tk.2500/tk.85/day(for temporary workers)	All are temporary workers Gross salary per month tk.1500-2000	Tk.3000/	Tk.1500/
Restraint time hours	4 -5	5 -7	08	08
Housing allowance	Tk.275/for permanent workers	No house allowance	No house allowance	No house allowance
remark	Tk. 5000 -7000 including earnings from second job	-	Tk.4000 including 3 hours overtime	Tk. 2500 including 3 hours overtime

Source: JICA 05:56

If we analyze the table we find that though the productivity of DCC workers is far less than the private cleaners but they get more salary than their counterparts. The above data shows the cronic mismanagement of resources of DCC

Public private Community Partnership

Time has not come to evaluate but it can be said that this kind of partnership includes all kinds of stakeholders, primary collectors to community leaders such as male and female ward commissioners, religious leaders, members of civil society would be fruitful if the roles and responsibilities of each and every partner is assigned clearly.

A Case study of SWM in ward -5

Bouniabad area is located in Mirpur under ward – 5. There are three to five big slums and the number of slum dwellers is around ten thousand. They work as day labor, waste pickers etc. DCC does not provide civic services to this area as they are not tax payer. The significant thing is that these low income people show civic sense though DCC's services is not there. With the help of local NGOs involved in primary collection, they have established a strong sense of SWM. They put wastes in their household bins or pots. NGOs collect wastes and dump near and there around the Berri band area. All tiny homes are adjacent but you do not find any waste here and there within their living area. They are also involved in recycling activities. The encouraging fact is that Most shops have a small bin in front and put business waste in it. They do not throw them in the roads. Comparatively the area is clean. But there is no direction from DCC about where the waste should be dumped. So NGOs dump the collected waste inside which is alarming as it mixes directly with water bodies which house fishes and other animals living on it. A section of slum dwellers backing with local politicians dump waste beside the band and build illegal makeshifts on it. In this way government land is being grabbed and water bodies are polluted. If there was any partnerships between NGOs and DCC, it is expected that most wastes would be collected by DCC. At least some bins or containers are there. DCC could collect and dump waste. Building partnerships both parties would be benefited. The indicators of urban governance through which it is measured, at least covering most of them. As a result, access to civic activities by ultra urban poor and participation of women could be ensured and equity had been maintained.

Limitations of DCC regarding SWM

DCC has nineteen source of income of its own but four or five of them contribute around sixty five percent of total earnings. Holding taxes are fifty five percent of DCC revenue earning. Most of revenue expenditure is incurred for salaries and wages. The own source of income.e for the year 01-02 was tk.1557.2 million and other source was tk. 540.5 million. The subsidy from Government for the last five years is increased from 25.77% to 38.43% (Islam 2003:67)

DCC charges conservancy tax of 2% based on property's rental value. The expenditure of swm is 52.87% more than the income . The per capita expenditure for swm in Dhaka is very low (Tk.53) compared to other Asian cities such as Bombay Tk. 304, Manila Tk. 192 and Bangkok tk. 84 (Enayetullah, 1995 :78)

DCC spent 15.42% of the total annual expenditure for SWM (Yousuf 1996:38). The cost of per ton swm is 930 Tk.(JICA 2005:87). DCC is functioning on the basis of ordinance of 1983. It has no specific clause or section for industrial or medical waste storage, handling collection, disposal either by DCC or any other authority. Recently Ministry of Forest and Environment introduced Medical waste handling rules .Necessary bylaws have not been yet introduced on standard of refuse quality and details of punishment of any offence detected by DCC mobile court. According to Environmental Conservation Act 1995, each and every industry has to ensure inhouse waste water treatment facility. With a view to it, Effluent treatment plant must be set up by the industry. Ministry of forest and environment is the regulatory authority to super vise the rules is obeyed or not. But there is no effective coordination among DCC, MoFE and other concerned organizations.

The sources and resources in relation to income of municipality are left exploited. The tendency of evasion of holding tax by the city dwellers and large scale commitment of the elected representatives are the main reasons of poor financial condition of DCC(Huda 07:101) .The assets of DCC are not well managed well and it creates artificial impediment on the of its self- sufficiency. so DCC has to depend on the subsidy of central govt. and support of donor agencies. Conservancy department gets more or less 2% of DCC's total budget. This small portion of allocation cannot meet the recurring and non recurring expenditure of SWM of DCC .(Huda 07:45)

The Mayor of DCC in meeting expressed discontent for very low level of taxes earmarked for conservancy work of the city of Dhaka. DCC has to provide huge subsidy from its annual revenue income in SWM .Forty one percent people live in slums as they are not under tax net, DCC is unable to lend civic service to them due to financial constraint .According to DCC Ordinance, assessment of tax has to be made in every five years but since 1985 (inception of ordinance) no holding tax assessment is done.

There are 26 heads of taxes under schedule of the DCC Ordinance (Huda 07:67). Many of these heads are left untouched from tax collection for an example from markets, bill boards, non motorized vehicles, community centers etc.. In this way DCC deprives of its legitimate income from various sources.

Very low productivity of conservancy workers creates pressure on the weak revenue of DCC. There are many factors responsible for low output. Recruitment of more workers beyond requirement, payment to ghost workers , engagement of bodli ,low level of wage are the main reasons .

DCC is empowered to enroll only waste workers or sweepers or cleaners on a temporary basis without sanction of prescribed authority. The municipal authority found misusing of power by recruiting huge number of waste workers beyond actual requirement, as a result productivity is low (Huda 2007:90). A good number of sweepers or cleaners serve as maids or servants in ward commissioner and senior officers at their residents. They also draw wages and benefits from DCC.

Actors and factors in solid waste management in Dhaka City

There are some differences regarding actors role in developed and developing countries as social , political, economic conditions are not same. Where informal sector plays significant role in developing countries , formal sectors are main actors in developed countries. Actors in solid waste

management both in developed and developing countries are more or less same. Differences happen in playing their roles.

Actors in SWM in Dhaka city

1. Mayor: Mayor is the people's representatives who is elected by popular vote and he/she is the chief officer of DCC. He is the key actor who plays most vibrant role in policy formulating. He formulates policy to manage solid waste.

2. CEO: Chief Executive Officer is the key actor in policy executing and he is accountable to Mayor directly. CEO is a senior (Joint Secretary) level bureaucrat of the Government.

3. CCO: Chief Conservancy Officer is the head of conservancy department that is entitled to manage SW and he is the chief policy executing officer regarding solid waste in DCC.

4. CBO: Community based organization plays significant role in primary collection of solid waste as DCC's responsibility is secondary collection, transportation and disposal. According to DCC rules, it is citizen's duty to bring their waste in DCC provided bins. So community's role is crucial. CBOs are emerged as the growing demand of citizens for door to door collection.

5. Ward Commissioner: He is elected through popular vote and his jurisdiction is within the ward. According to Clean Dhaka city Master plan prepared by JICA supervised by DCC, Ward commissioner is the head of community motivational programs and his role is vital in primary collection which is the core component of urban swm.

5. Household: Households are key actors in primary collection as well as overall swm. They are key stakeholders in sw related policy formulation and execution. Environmental conservation is mostly depends on their role

6. Business Community :They also play role in swm. It is the civic duty of each and every industrialist to keep their environment sound. According to DCC, there are –markets and industrial waste accounts for roughly 23 percent. According to Environmental Conservation Act, 1995, each and every industry has to set up effluent treatment plant (ETP) to treat waste. But this is not followed by most of the industrialists. Though their role should be motivating to conserve the environment.

7. **Waste picker:** For the urban poor in developing countries, informal waste recycling is a common way to earn income. They are informal actors in swm. At present DCC has no recycling project and

15 percent waste is recycled by them. Waste pickers' role is important not only in Bangladesh but also in all developing countries due to social, economic context of the world. In developing countries about 1 percent of the urban population—at least 15 million people—survive by salvaging recyclables from wastes. For instance, over 20,000 women work as paper pickers in Ahmedabad city (Salahuddin & Shamim, 1992). It has been estimated that up to 150,000 waste pickers are active in Municipal Corporation of Delhi area (UNEP 2005).

In fact, all cities in the developing world have a sizeable population that ekes out a living from picking waste generated by their wealthier neighbours. This is the most vulnerable and marginalized group that comprises mostly of women and children.

Factors in Solid Waste Management:

Solid waste management is considered to be a multi-dimensional issue due to the variety of factors involved. Such factors indicatively include technology issues in respect to environmental performance and output, issues of strategic and political policy and planning, public awareness and social maturity questions, as well as issues of financial viability. Factors can be divided into the following categories irrespective of economic context. 1. social factors 2. economic factors

.Social factors:

Attitude towards waste: The residents of Dhaka city are heterogeneous in character in respect to their social and economic status. We can classify the people living in Dhaka into three broad categories depending on economic parameters. These are 1. Upperclass 2. Middle class 3. Lower class. Upper class people depend on their servants for solid waste disposal, so they do not have any headache where servants are putting waste, in dustbins or not. Middle class people try to ensure to make their homes and surroundings clean but they have little interest about where CBOs dispose their waste. A very few people whom we can call as civil society, have access to seminar, workshop, conferences etc. on proper SWM but they do not share their knowledge with other sections of society. One example is establishment of dairy farms within DCC area. According to DCC ordinance, dairy farms are prohibited within DCC area but such dairy farms had been found in the campus of Parliament house, residential area of Dhanmondi, Uttara, Mirpur and other similar important areas where most of civil society members and senior citizens live. According to Huda

(2008 :235), ex CEO, DCC , there are more than one thousand dairy farms in the city without lawful authority.

Littering: Littering is defined as things scattered about or left in disorder, espically in public places or outdoors in a messy state(Huda 08 :235). According to WHO, 1996, no littering is far better and cheaper than cleaning up. Some author argue(WHO) that the rural urban migrate people who are not aware of disciplines of city life. But this not fullytrue. The elite and educated citizens are not less responsible. Many of these people have opportunity to visit developed countries and seen the disciplined attitude of city dwellers. But they did not practice it in their home country . They throw trashes from running cars, leave empty packets re and there though they know it is the violation of law.

Littering Human excreta: More than two billion are without any form of improve sanitation in the world.Only 1.1 billion of total six billion have their sewage treated in an environmentally acceptable way. It means that the excreta from 5.9 billion are discharged in to the environment , on the land and to the water bodies(Sabur,2007). About sixty percent of the total population of Bangladesh can't afford to sanitary latrines of any form. About forty one percent of urbanpopulation of Bangladesh lives in slums and squatters . Only fourteen percent of them access to sanitation .According to Huda (2008:245) this 85percent of 41percent slum dwellers in Dhaka city make natural call on open space. The solid portion of human excreta deposited throughout Dhaka city in a day is about 375 metric tons.

Economic Factors:

1. **Budget Constraints:** DCC budgeted Tk 2,670 million of their own account for financial year 02/03. The problem of finance is that revenues collected were only 70% of budgeted amounts, on average, from 2000-01 to 2002-03. This income gap compels DCC to squeeze its expenditures except for salary/wages.

The major source of revenue is holding tax that accounts for 63% of revenue.in 2001-02,total SWM income was 150 million and expenditure was 402 .on the other hand, in 2002-03 it was 176 million taka and expenditure was 476million. Budget deficit is 300 million taka . This statements shows that DCC suffering from the cronic budget deficit .Fifty to sixty percent income is spent on salaries of staffs for swm. Only twenty to thirty percent revenue spent on waste collection, transportation and disposal. The Asian Development Bank (ADB 2001:72) estimates that urban authorities in Asia

spend 50%-70% of their total revenues on waste management. In a separate study by the World Bank, neglect of the environment is calculated to cost an average of 5% of gross domestic product (GDP), while government spending on environmental protection amounts to less than 1% of GDP! (3R practice in east and south-east Asia, Waste Management World - September, 2007. available in www.3rkh.net)

2. Income level of citizens:

41% percent of total city dwellers who live in slums are out of tax net of DCC. This statement shows that DCC does not provide swm service to the majority segment of population. As this low income people do not pay tax, they are deprived of sanitation and urban services which indicate poor governance of urban authority.

Other factors :

Cleaners and Drivers association: According to high officials of DCC, it is the vital factor in managing waste. The total number of cleaners in DCC is not less than seven thousand and this huge number of workforce is unproductive as most of cleaners are aged. They do not work properly but authority can not take stern action due to strong stand of their associations. They are not motivated to discharge their duties. When authority wants to take stern action against them, they protest in the banner of their association and stop work that means waste remains uncollected. They also put political pressure on DCC officials. So authority can not take any decision against them.

Conclusion: The next chapter will deal with analysis based on primary and secondary data that was collected through interview, questionnaire and case study. It also focuses on potentialities of PPP in SWM and analyze how it can be replicated in other sector. Finally a concrete conclusion along with some specific recommendations is also presented.

CHAPTER –5

Analysis and Conclusion

According to Waste Management Division of DCC in 2002/2003, solid waste management expenditure was 476 million taka and revenue earning was 176 million taka. Overall Budget deficit was 300 million taka that means DCC has been suffering from chronic budget deficit.

DCC is divided into ten zones and out of ten zones PPP has been introduced in two zones, zone 9 & 10. In 2003, due to PPP, cost was reduced drastically. Before introducing PPP, yearly SWM cost was in these two zones, was 53 million taka and after inception of PPP in 2003 average yearly cost was 37 million taka. The difference was 16 million taka that means PPP not only reduced cost but also ensured efficiency of service delivery. According to a Study launched by JICA, 2005, 45 percent DCC workers employ labor only for 4 to 4.5 hours while it is 6 to 6.5 hours for private workers. Though DCC workers paid more than private workers, they work less.

As I mentioned earlier due to partnership with private organization, cost has been reduced and this model of PPP is sustaining. Since Conservancy department has been suffering budget deficit and not able to ensure 100% waste collection and disposal, PPP is an excellent option for DCC to its SW business smoothly and ensure environmental sustainability. Through PPP DCC can provide civic service effectively and enhance

Workers productivity. It also lessens maintenance cost of vehicles.

Table No.29

Cost Reduction through PPP (Million taka)

SWM in 8 wards (Zone 9 & 10)	Cost
DCC own cost	53.1
Private Organizations	37.0
Average cost cut	16.1

Source: JICA 05:78

According to the above table, we find that average cost TK.. Sixteen million taka had been reduced in 2003 in eight wards of zone 9&10 due to partnership between private and public organizations. Before 2003, the annual SWMcost was 53.1 million taka and after privatization it took only 37 million taka to manage the whole task.

Table No. 30

Breakdown of cost cut (Million taka)

Cost Items	a.DCC(taka million)	B.Private organizations(taka million)	Cost cut = a-b
Personnel	27.5	16.7	10.8
Fuel	9.0	6.4	2.6
Others	16.6	13.9	2.7

Source:JICA 05:56

The above table revealed that majority of the personnel cost that was derived from cleaners' salary of Tk. 10.0 million as shown in Table. Further broken down the cost into 2 factors: Tk. 3.3 million by downsizing the number of cleaners and Tk. 6.8 million by downsizing the cleaners' salary. Thus, it is quite obvious that the lower level of cleaners' salary of private organizations is a major contributor of cost cut by privatization

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Workers productivity. It also lessens maintenance cost of vehicles.

PPP in SWM : Some potentialities

CDM is the only flexibility mechanism that involves developing countries (Non- Annex B). It allows developed countries (Annex-B) to achieve part of their reduction obligations through investment in projects in developing countries that reduce GHG emissions or fix or sequester carbon dioxide from the atmosphere.

What is Clean Development Mechanism (CDM)?

CDM(Clean Development Mechanism) : According to Kyoto Protocol Annex B countries have to reduce 50 percent GHG reduction in 2008-12 compared to 1990. So Annex B countries are buyers and Non Annex B countries are sellers. Market. Through CDM projects industries in developing countries can be technologically upgraded and made environment friendly thus contributing to global climate protection as well as promoting sustainable development in the host country. The industrialized countries' investing entities can earn credit for emission reductions achieved through its investment in developing country towards its own emission commitment.

Potential Sectors for CDM Projects in Bangladesh are

1. Energy, both supply side and demand side.
2. Waste
3. Forestry

Kitchen Waste:

There are twenty seven kitchen markets authorized by DCC(Ittafaq, 8th june,09) . About one hundred twenty such kind of markets are flourished privately without prior approval of DCC.

According to researchers, these one hundred forty seven markets produce ten tons of kitchen waste everyday. The mentioned amount of waste which dumps in the DCC dustbins and the buying and selling of these dustbins is a lucrative business for middlemen specially cleaners. A handsome amount of transaction had been occurred last year, approximately three hundred sixty crores and fifty lac taka. (The Daily Ittfaq, 8th june, 09). About twelve dustbins are put in Karwan Bazar which produces the largest amount of kitchen waste of the said amount and each and every dustbin is sold three to five lac taka every year. Dustbins are sold in daily basis yearly transaction is more or less forty to sixty lac taka. The amazing fact is this large amount of money does not go to government exchequer as middlemen like drivers, cleaners are involved in it. They do not dump in landfills rather sell it in the market as it has economic value.

If PPP is entertained in this sector, DCC would be benefited in many ways such as financially and able to overcome budget deficit in SWM as it is suffering. DCC can provide civic services to urban poor with this money and improve quality of life of them which ultimately leads to better urban governance. As this initiative would open up employment opportunities for urban poor, it would generate income for them specially women. In the long run PPP will help in maintaining environmental conservation, clean Dhaka city

Kitchen waste as resource

According to environmental researchers, it is possible to produce three tons animal food which contains sixty percent protein and a lot of calcium using ten tons waste of fishes and other organic wastes. If PPP is allowed in this sector, it will save foreign currency through decreasing of import of animal food. Lessen environmental pollution and governance would be improved if transparency, accountability and equity are ensured.

Table No:31

Tangible and non tangible benefits from public private partnership

At micro level	At macro level
Provides work and earning opportunity to the urban poor.	Cleaner neighborhood and streets. Increases residents' happiness and enhances the quality of life.
Reduces municipal cost of garbage collection and disposal waste. Save land fill area.	Reduces the quantum of garbage. Reduces environmental pollution. Reduces other environmental costs proper utilization of land Reduces blocking of drains and sewers. Improves sanitation. Increases the aesthetic beauty of city.
Saves foreign exchange which would otherwise be used to import expensive technology and machinery (e.g., including machine and costly fancy vehicles).	Saves resources which add significantly in a positive way to sustainable urban development
Skilled manpower as DCC provides staff under PPP and enhances motivation of staff.	Strengthens institutional capacity of DCC and effective , efficient Urban governance

What about Matuail?

A master plan on solid waste management has been formulated in 2005 with a target year of 2015 to make Dhaka City clean (JICA 2005:23). The master plan is emphasized on public awareness, primary waste collection, transportation, final disposal as well as administration and financial management. As part of the implementation of the master plan, Dhaka City Corporation has constructed the first ever sanitary landfill in Bangladesh, which has inaugurated on 3rd October, 2007 for full-scale operation. The total area of the landfill is about 40 hectare; out of which on an area of 20 hectare a 15 years old open dump is situated, and which has been converted into controlled landfill through this project. The additional 20 hectares is an extended part which has also developed for future landfilling. The total project cost is 466.3 million taka (7 million US \$), which has been allocated through JBIC (Japan Bank of International Cooperation) JDCF (Japan Debt Cancellation Fund). The project was started in July 2005 for a two years period. Major sanitary landfill components introduced under the Project were the leachate collection and gas venting system, surface drainage improvement, systematic operation of waste by daily covering, slope reformation, working roads, weighbridge operation, and vehicle washing facilities. A semi-aerobic landfill system has been adopted to reduce the polluting load on the environment and speed up the stabilization of the disposed waste. A perforated pipe network for leachate collection and gas venting arrangement has been installed for proper collection of the leachate and provision of air supply system. Periodical monitoring of the environmental parameters of the ground and surface water, leachate quality and landfill gas is introduced as part of the operational measure of the sanitary landfill

Conclusion and Recommendations

The main purpose of my study was to understand the citizen's perception on the SWM problem of their locality and to see how solid waste is collected cost effectively. I also tried to explore how solid waste is managed environmentally sustainable and in this regard how PPP helps. Throughout the chapters I discussed the issues on the basis of my information gathered by means of field observations, in-depth interviews of my key respondents.

Field evidence suggests that urban citizens consider solid waste a major problem of their localities, but particular emphasis is given to its sustainable management either through building public-private partnerships or privatising the delivery of conservancy services by means of contracting out its operation. Common citizens want to pay more for SWM but community initiatives are not at large stage and governance process is not enough to include all stakeholders. PPP is in a nascent stage and there are some points of contradictions as transparency, accountability and other good governance index are not present fully. PPP is the best instrument to minimize cost, to entertain private sectors to compete with public sector based on comparative advantage what has already found in my research. It should be encouraged and take some meaningful initiatives to reduce cost and conserve our environment healthy.

Solid waste management is considered to be a multi-dimensional issue due to the variety of factors involved. Such factors indicatively include technology issues in respect to environmental performance and output, issues of strategic and political policy and planning, public awareness and social maturity questions, as well as issues of financial viability. Incorporating waste pickers into waste management and recycling programs can in many cases be socially desirable, economically viable, and environmentally sound. To do so, however, decision makers need to recognize that waste pickers can be an asset, and municipalities need to engage with them as potential partners.

The SWM sector in developing countries will face increasing strain under rapidly growing urbanisation. Alternatives to the present mode of delivering service by the public and private sector working in isolation may become imperative to maintain a minimum quality of service.

Theoretical and practical considerations indicate that there is a good potential for public-private partnerships in the SWM sector in developing countries. However, the conventional approach to public-private partnership in the developed countries, where large conglomerates and government agencies form alliances, may need to be modified for developing countries. A vertical integration of SWM services between small-scale operators and the public sector may offer a better choice in these countries. Partnerships will not be effective and sustainable unless there is incentive for both public and private agencies to enter into it. The following steps should be taken to promote public private partnership in SWM.

Recommendations

- 1.Private sector should be allowed to earn experiences for handling waste management more effectively.
- 2.Detect the loopholes or causes of unsatisfactory performance in the Wards of DCC under PPP.
- 3.Make the deed of contract process transparent and unambiguous.
4. Deed of contract should be prepared very carefully to avoid any kind of confusion and contradiction.
5. Experiences of public and private sector in SWM should be replicated in other cities and towns with necessary adjustments on local context.
- 6.Reasonable agreement (market based and maintain equity)between DCC and private organizations for absorbing the regular employees of the conservancy department with private sector to benefit from their skills and expertise as well as to avoid sudden unemployed shock.
- 7.Impose user charge along with existing holding tax. User charge should be less and within the willingness to pay level of citizens.
- 8.Take strategic plans to replicate PPP's success.
9. Stop misuse and pilferage of sources and resources.
10. Evaluation of existing holding tax based on market.
- 11.Strengthen the capacity of the DCC through knowledge sharing with concern stakeholders.
12. Coordination with concern departments involved in SWM for developing better understanding and Consensus Building

Conclusion: A new set of incentives must be designed for both private and public sectors. Other barriers for meaningful partnership include weak structural, financial and legal framework. These weaknesses provide outlets for lack of transparency, fairness and accountability—the underpinnings of effective partnership. Repressive regulation or excessive competition may drive out the private operators. Partnerships must also be dynamic, adjusting to new situations as both private and public sector agencies evolve in terms of scope and nature. Therefore, the design of a partnership calls for a balanced and measured approach. There may be a need for a facilitating agency to nurture partnerships with possible subsidies. Capacity for effecting proper partnerships does not exist in either public or private SWM agencies in low-income countries. Translating theories into realities requires research and advocacy, building political will and popular support .Before then, studies should be conducted to assess the gaps and prevailing situation both in light of demand and supply side.

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